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COMMUNICATIONS & TECHNOLOGY

FEBRUARY 2002

CQ

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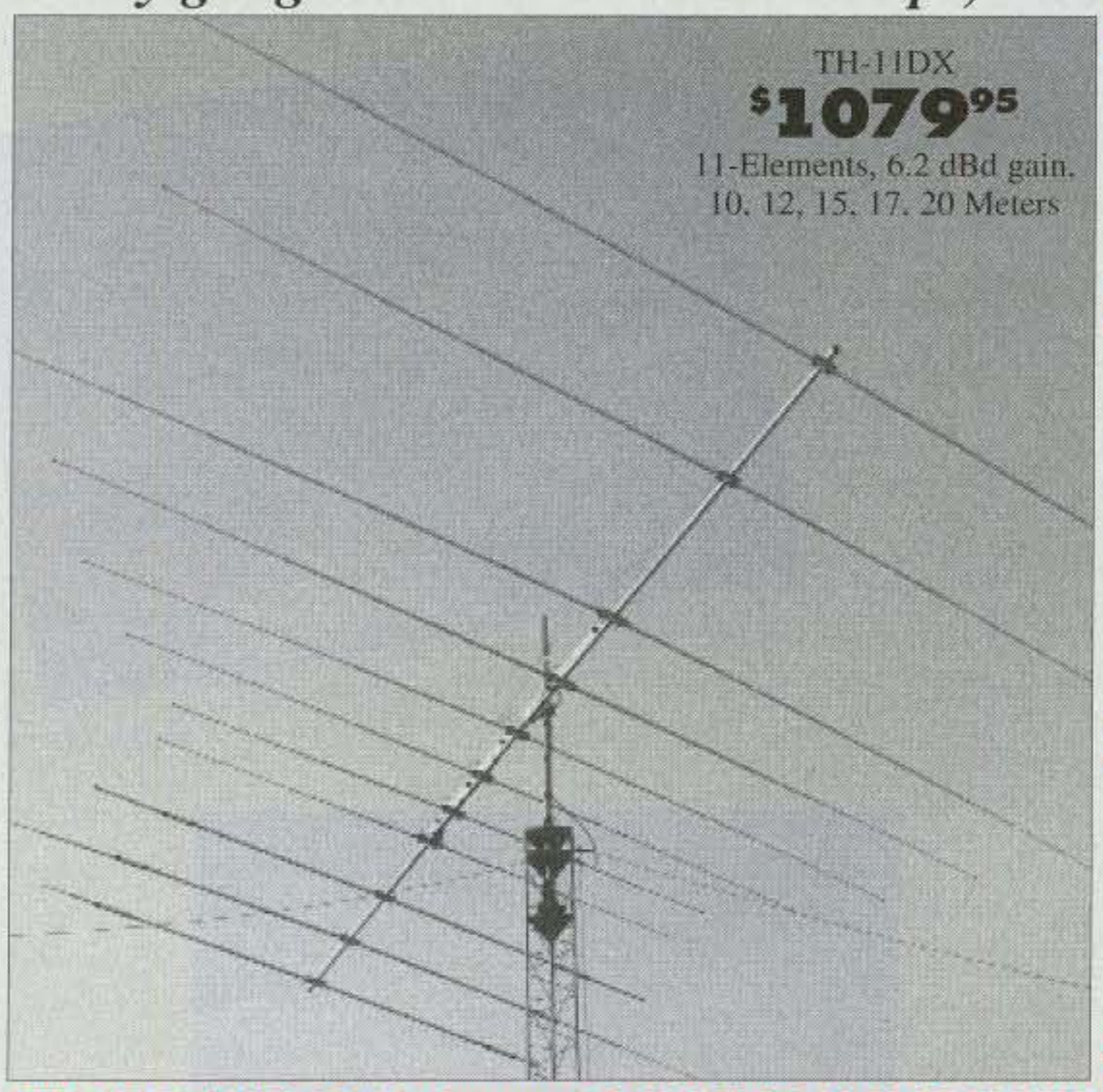

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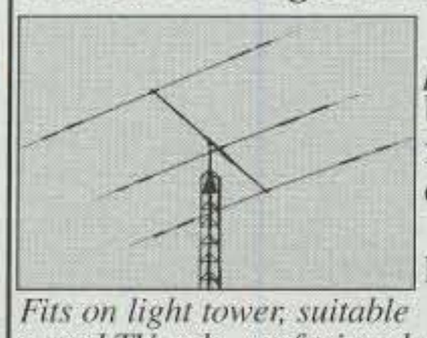

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TH-3MK4	**3**	**5.8**	**25**	**1500**	**10, 15, 20**	**4.6**	**95**	**14**	**27.42**	**15.33**	**35**	**1.9-2.5**	**CD-45II**	**$439.95**
TH-3JRS	3	5.8	25	600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$329.95
TH-2MK3	**2**	**3.4**	**15-20**	**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$339.95**
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Ham Radio News

From The CQ Newsroom

Vanity Calls Still on Hold

Processing of vanity callsign applications was still suspended as we went to press in mid-December, as the FCC continued to untangle a mail mess created as a result of anthrax precautions. According to the *ARRL Letter*, even vanity applications submitted by e-mail are being held up, due to an FCC policy giving equal priority to applications received by e-mail and postal mail. However, fees paid electronically via credit card along with e-mail applications are being charged to applicants' accounts.

An FCC spokesperson in Washington assured the *Letter* that no mail to the Commission had been destroyed, and added that the FCC most likely will grant extensions on filing comments on proceedings in which paper filings might have been caught up in the decontamination process. In a related matter, *Newsline* reported that the FCC Library in Washington had been closed to the public until further notice, because part of it is being used as temporary office space for FCC employees.

Hollingsworth: Ham Radio is the Only Fail-Safe Communication Service

Amateur radio is "an incredible national resource and the only truly fail-safe communication service on the planet Earth," according to FCC Special Counsel Riley Hollingsworth, K4ZDH. In a statement provided to the ARRL to mark the beginning of his fourth year as the Commission's amateur radio enforcement chief, Hollingsworth praised the "energy and compassion and excellent operating" of amateurs in the wake of last fall's terrorist attacks, and described the overall level of rule compliance among hams as "outstanding."

On the other hand, Hollingsworth noted, "far too many operators" forget that their signals are heard around the world and don't think about how their on-air behavior is perceived by others. "(They) don't realize what a bad reflection they are on American amateur operators," he noted. Hollingsworth also expressed optimism about the future of amateur radio but added that hams need to do a better job of educating the public and the media "about the wonderful benefits of Amateur Radio."

Tough Enough for Afghanistan

Sharp-eyed hams watching the news in December may have noticed what looked like ham radio handhelds in the hands of Afghan fighters chasing Al Qaeda forces out of Tora Bora. Indeed, one closeup revealed a soldier listening to a Yaesu FT-23R! ("Fortunately, it was the good guys using it," quipped Yaesu's Chip Margelli, K7JA.) Therefore, you might not be hearing YA callsigns on the air in great numbers, but it seems the VHF ham bands in Afghanistan are quite busy anyway!

If you're into shortwave listening, *Popular Communications* Editor Harold Ort, N2RLL, reports that the Voice of Afghanistan is active from a transmitter in Samara, Russia, with 500 kw on 9950 kHz, in Pashto and Farsi, between 1330 and 1430 UTC. Reception reports go to <afbc9950@hotmail.com>.

New Extra Class Questions Released

The Question Pool Committee (QPC) of the National Conference of Volunteer Examiner Coordinators has released a new question pool for the Element 4 (Extra Class) written examination. The questions in the new pool will be used in all Extra Class written exams between July 1, 2002 and June 30, 2005. There are 20% more questions in the new pool than the old, according to the QPC, but the exam itself will remain at 50 questions. Three questions were pulled from the pool without explanation about two weeks after the pool was released. Two dealt with HF digital modes and one had to do with calculating the voltage at the output of a circuit shown in a diagram.

The QPC is now soliciting comments and suggestions for the next revision of the Technician Class (Element 2) question pool, due to be updated in 2003.

From Spark to Space

The 100th anniversary of Marconi's first reception of a transatlantic radio signal on December 12, 1901 was observed in a variety of ways on the ham bands. Several of the most notable involved communication that Marconi probably never imagined— radio signals from spacecraft in orbit.

The *ARRL Letter* reported on a school contact between special event station VO1S at Signal Hill, Newfoundland, and NA1SS on the International Space Station. Astronaut Frank Culbertson, KD5OPQ, answered questions from ten ninth-graders during the brief contact. In addition, the AMSAT News Service reports several amateur satellites carried special messages on December 12, including two newly-launched satellites. Sapphire carried two special voice announcements, while PCSat transmitted Marconi's historic letter "S" and OSCAR-1's "HI." (December also marked the 40th anniversary of the amateur satellite program.)

The other major part of the Marconi centennial observance was the activation of a spark transmitter on the amateur bands for the first time in many years. The ARRL reported that David Wilson, VE3BBN, operated, with permission, for an hour on the evening of December 12, transmitting "MARCONI S" once a minute on approximately 3550 kHz. Reception reports may be e-mailed to Wilson at <david@computan.on.ca>.

AO-40 Off the Air Until April

By the time you read this, a planned shutdown of the transponders on the OSCAR-40 satellite should already be in effect. The transponders were scheduled to be turned off from about Christmas to mid-April due to poor solar illumination. The spacecraft depends on solar energy for its power.

According to the ARRL, a scheduled shift in attitude—the satellite's position relative to the Earth—to compensate for the unfavorable sun angle would leave AO-40's antennas pointing away from Earth until springtime. AO-40 control station Stacey Mills, W4SM, told the ARRL that efforts will be made to minimize the satellite's "off" time. "It's possible that we can leave the transponders on during the first part of the move and turn them back on slightly before April 15 ," Mills said, "but you can figure that things will be sub-optimal from about Christmas until April 15." For updated information on AO-40, see the AMSAT-NA website at <http://www.amsat.org> or the news page on the *CQ* website.

In other satellite-related news, the Starshine-3 satellite has been designated as Starshine-OSCAR-43 (SO-43) at the request of Starshine Project Director Gil Moore, N7YTK, according to the AMSAT News Service. A "mirror ball" satellite downlinking telemetry on 2 meters, the satellite is intended to be visible from the ground and to help research the effects of atmospheric drag on satellites. For more information, see <http://science.msfc.nasa.gov/headlines/y2001/ast09oct_1.htm>.

Russia and Australia are working on a joint amateur satellite project. *Newsline* reports that Kolibir 2000 is a microsatellite that is scheduled to be taken to the International Space Station aboard a Russian cargo ship sometime this year, then orbit attached to the space station before being launched on its own.

FCC and Baxter Square Off Again

A battle is brewing between the FCC and Maine amateur Glenn Baxter, K1MAN. Baxter was well known for his International Amateur Radio Network information broadcasts before going off the air for a year after a visit by FCC inspectors (No one was at

the station when the inspectors arrived, even though it was on the air.). The transmissions resumed recently, and now so has Baxter's battle with the FCC.

In a December 11 letter to Baxter, FCC Special Counsel Riley Hollingsworth, K4ZDH, warned him to stop sending "Standard Felony Complaint Affidavits" to amateurs who apparently do not change frequencies when Baxter's scheduled transmissions begin, or whom Baxter perceives to be interfering with his station. Hollingsworth quotes a letter sent to Baxter by the US Attorney in his area asking him to stop sending the affidavits to him, and warning him to stop sending "threatening communication" to other amateurs. Hollingsworth warns Baxter that "any attempts to threaten or intimidate Amateur Radio licensees" could result in an FCC move to revoke his amateur license.

Baxter fired back with a letter, copied to the ham media, which consisted mostly of personal attacks against Hollingsworth and threats of legal action against him.

ARRL Seeks Teacher Volunteers

The ARRL is recruiting about a dozen teachers to help write the curriculum for "The Big Project," the ARRL's program to try to get amateur radio stations and programs into schools around the United States. Interested teachers should contact Education Project Director Jerry Hill, KH6HU, at ARRL headquarters or by e-mail to <kh6hu@arrl.org>.

FCC Okays Higher Power for Unlicensed Devices at 2400 MHz

The FCC has approved issued new rules permitting certain unlicensed (Part 15) devices operating between 2405 and 2450 MHz to use higher power, but under significant restrictions. The band is allocated to amateurs on a co-secondary basis.

In a decision adopted on December 11, the FCC approved a petition by Sierra Digital Communications, Inc. to permit unlicensed fixed point-to-point transmitters in the band to operate at field strengths of up to 2500 mV/m (millivolts per meter), a tenfold increase. Sierra manufactures and sells equipment for wireless data communications, including high-speed wireless computer networks and internet links. The ARRL had opposed Sierra's petition on the basis of increased risk of interference to amateur and amateur satellite operations. Currently, the only operational downlink from the AO-40 satellite is in the 2.4 GHz band. More details and a link to the full FCC ruling are on the *CQ* website news page.

Additional and updated news is available on the Ham Radio News page of the CQ website at <http://www.cq-amateur-radio.com>. For breaking news stories, plus info on additional items of interest, sign up for CQ's free online newsletter service. Just click on "CQ Newsletter" on the home page of our website.

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BY RICH MOSESON, W2VU

An Editorial

The Urge To Learn

Every human being is born with an innate desire to learn—to explore his or her world and discover first-hand what things do and why. This natural curiosity can get one into trouble, of course, which is why parents of toddlers try to "childproof" their homes. Channeling natural curiosity into structured education is the goal of an institution society has created known as "school." There's a problem, though. School is supposed to be neat, orderly and structured. Natural curiosity has a tendency to be messy, disorderly and unstructured. School, in many cases, has developed into a highly effective "antidote" to natural curiosity. But it's not 100% effective, and some of us remain curious about our world (and sometimes what's beyond it) even after spending 12, 16, or 20 years "getting educated." Many hams fall into that category (and maybe that's why there are relatively few hams as a percentage of the general population).

Experimenting, learning, discovering—all have been a part of the tradition of ham radio. Many people think that part of our tradition is dead or dying, and that the miniaturization of solid-state electronics is eliminating the opportunity to build, experiment, and learn. But as usual, I disagree.

First of all, the builders and experimenters are still with us, and in probably about the same proportion that we've had since there was an option to buy your gear instead of building it. Based on a year's worth of demographic information gathered in our admittedly non-scientific reader surveys, on average, one in five *CQ* readers identifies himself as active in experimenting. And when we asked readers a year ago about their own experience in building equipment, only 8% said they'd never built anything at all! Asked to rate their building ability, 16% called themselves expert builders, 26% ranked themselves advanced, 37% said they were "experienced" and only 21% termed themselves "novice" builders (10% were non-builders). So the numbers simply don't match up with the commonly-held perception (by 75% of those same readers) that hams today don't and can't build equipment.

In addition, there are opportunities to learn and discover that are not necessarily connected to building equipment. Even after 100 years, radio is still as much an art as a science, and there remains quite a bit about radio that isn't fully understood or hasn't been thoroughly tested, and that calls out for hams to dig in and learn more. One big example is radio wave propagation. Sure, we know that the ionosphere refracts &/or reflects our signals to faraway places, and that which frequencies are best for DXing depends on time of day, time of year and time of sunspot cycle. But we don't *really* know the mechanics of how it all works.

In this month's issue, you'll find the first part of a fascinating study by VK6VZ, VK6HD, and NM7M on propagation paths on 160 meters. What they've discovered challenges long-held assumptions about how your signal travels from Point A to Point B on "top band." Plus, propagation on the "magic band," 6 meters, has continued to be magical but not fully understood. My experience with recent six-meter F2 openings to Europe has been that they are very tightly focused—to just one or two adjacent countries, for example—as opposed to F2 on the lower bands that seems to create openings to wide geographic areas. In other words, where 10 meters might be open to Europe, 6 is open to the Netherlands, or to the UK (but not both). I posed the question of why to some of our propagation experts. They confirmed the validity of my observations, and offered some speculation, but didn't really know *why* the nature of F2 propagation is different on one band than on another. Do you? (See this month's "VHF-Plus" and "Propagation" columns for more on these "best-ever" 6-meter openings.)

Also in this issue, Contributing Editor Dave Ingram, K4TWJ, reports on the response to his "Survival Radio Challenge"—one which called for hams to design self-contained stations for emergency use, and discusses plans for a second challenge this year, another opportunity for hams to tinker, design, build and learn.

Here's more: Elecraft, which builds rigs mostly for QRP use, sponsored a month-long contest in November and December for hams to come up with innovative design concepts for ham-related gear that fits inside the enclosure used for their K1 transceiver. Three of the enclosures were to be given away as prizes. According to *Newsline*, which interviewed Elecraft's Eric Swartz, WA6HQQ, the goal is to help stimulate the creative process in the ham radio community. Swartz points out that there is already "quite a strong building and home-brewing community" among QRPers.

Another challenge: A few of us at the office have been playing with a pair of Alinco DJ-596 VHF/UHF handhelds. These are HTs with a *digital voice* option, as explained last month in this column and by W8FX in his "What's New" column. I'll be doing a complete review soon, but I wanted to share with you now some of the philosophy behind this radio—one that ties right in to what we're discussing this month. One of my questions for the folks at Alinco was what the practical benefit would be to hams in using digital audio right now, especially since there really is no infrastructure in place, such as digital repeaters, for extending VHF/UHF coverage beyond simplex range.

Alinco Manager Katsumi "Naky" Nakata, KE6RD/JE3AVS, responded as follows:

"By offering the DJ596 and DR135 series radios (*a digital audio board is also available for the DR-135 series of mobile radios—ed.*), amateurs can test and experience the digital voice mode at affordable prices. The spirit of amateur radio is to experiment with something new in communication and radio technology ... We just wanted to offer a new playground on voice communication to the amateurs. After that it's only hams' imagination that will limit how to play with it."

Naky also noted that the JARL (Japan's national amateur association) is already experimenting with a digital networking project. It's something that has been talked about here as well, but has never really gotten off the ground. Perhaps the availability of reasonably-priced equipment (list price for the 596 plus digital board is just over $400) will spur those projects to get moving again ... or perhaps motivate hams to find something entirely different to do with digital voice. As Naky said, only hams' imagination will limit how to play with it.

Play...

Note the multiple use of the word "play" in the preceding paragraphs. I said we were *playing* with these radios at the office. Naky said Alinco wanted to offer hams a new *playground* for voice communications, and that only our imaginations would limit how we *play* with this technology. Most of us, of course, refer to our radios and other equipment as "toys." This is a vital concept and not one to be taken lightly.

What we hams define as "play" is often research and learning disguised as fun. When we get on the radio, it's generally during our "play" time. Yes, at *CQ*, we can occasionally justify walking around with handhelds, talking from one end of the hall to the other and putting up with abuse from our non-ham co-workers (like those in our office who quickly put together a string telephone ... they were just jealous, of course). But even those of us lucky enough to work in amateur radio usually have other things to

occupy our time during the workday ... even if that happens to be when a particular band is open! So we either wait, or we sneak away (during lunch or another sanctioned break, of course) to "play" on the radio.

But this kind of "play" can result in serious learning ... by playing on the radio, we learn which bands are best at what time for contacting different places; we learn the capabilities of our stations and our own capabilities as operators. If an emergency arises, the more time you've spent "playing" on the radio, the better position you'll be in to offer valuable help. By "playing" with designs for a circuit to fit inside a certain-size box, you might accidentally come up with a viable commercial product. By "playing" with digital audio on a handheld, and maybe trying different things in conjunction with a computer or two, or maybe... maybe something no one's thought of yet, you might come up with a whole new application for digital audio or a whole new way to move radio signals from one place to another. Who knows? You gotta play. It pays. (It's a lesson our schools could use as well.)

Beyond Ham Radio

Once upon a time, ham radio was the primary source of innovation in electronics and wireless communications. We all know that's no longer the case. There's lots of stuff going on in the rest of the world—stuff that could have applications in ham radio, stuff that could have applications in your job, and stuff that's just plain interesting. And as we've noted above, hams have this tendency to be interested in stuff that's just plain interesting. However, since the big words on the top of our cover each month say "Amateur Radio," we've resisted the occasional temptation to run articles that may be very interesting, very cutting-edge, but don't have a direct connection to amateur radio. A total focus on amateur radio has always been an essential part of *CQ*'s identity. We're cognizant of the fact that your interests don't stop at the edges of the ham bands. We're also aware of our own history, and that *CQ*'s predecessor, *Radio* magazine, expanded its focus significantly beyond ham radio and eventually lost that focus altogether. But those were very different times.

In between playing with digital audio on handhelds, one topic of discussion at our office has been whether it might be a good idea to lift the tent flap a little, and let a bit of the world beyond amateur radio into the pages of *CQ*. Perhaps an occasional feature article, perhaps a quarterly column that does kind of a roundup of new and interesting technology.

For example, I received a news release today from a Rhode Island company called KVH Industries that has introduced a satellite TV antenna for RVs and trucks that automatically identifies and acquires signals from a range of direct broadcast TV satellites, as well as its own high-speed mobile internet service. This is technology that has nothing to do with ham radio, but ... it certainly could be of interest to hams who operate amateur satellites (or want to promote amateur satellite use), or those interested in mobile wireless data communication (perhaps with a little more speed and bandwidth than 1200 baud packet). More than that, it could be of interest to the many hams who own RVs and motorhomes and would like to know about a new gadget that can simplify their satellite TV viewing and/or internet access.

I don't know if I could justify a feature article about this product without an amateur radio "angle," but I could see it included in a "roundup" column. We quickly agreed that we wouldn't make any decisions along those lines without consulting you, the reader. So we're asking for your input. This month's reader survey asks about your views on extending the focus of *CQ* slightly beyond the borders of ham radio. I encourage you to complete and return the survey, and if you have ideas and comments that go beyond circling numbers on a card, please feel free to write or e-mail us. Thanks.

73, Rich, W2VU

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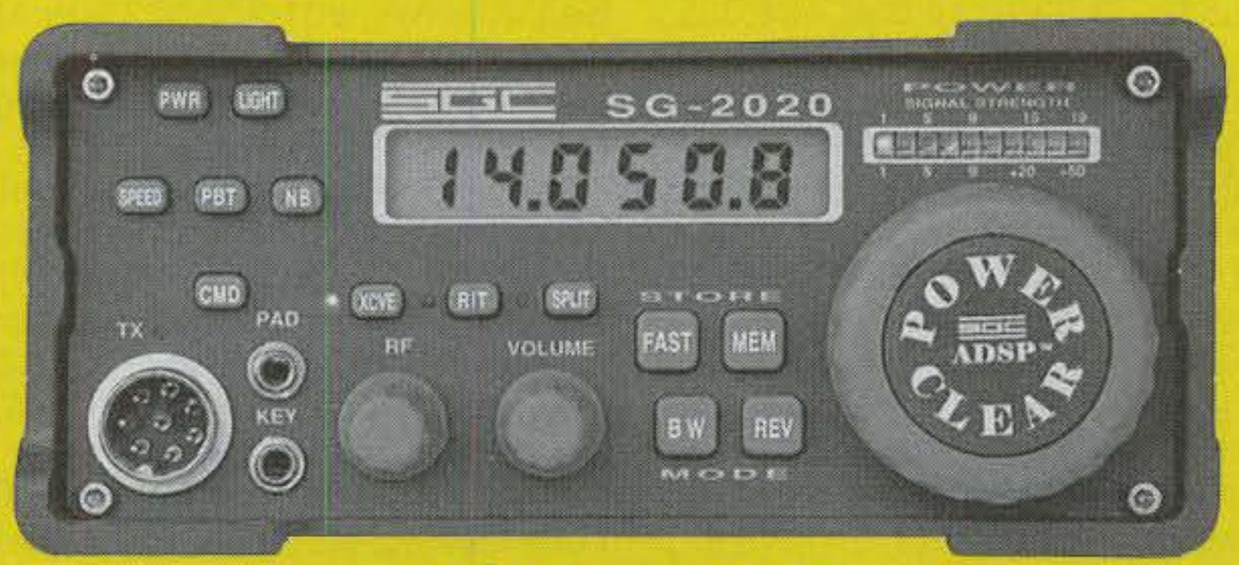

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Announcements

New Hampshire QSO Party - Sponsored by the ARRL of New Hampshire; 0000Z Feb. 2 to 2400Z Feb. 3, 2002 on 160, 80, 40, 20, 15, 10 meters plus VHF/UHF. Operate a total of 24 hours of the 48-hour contest. Classes: Single Transmitter QRP (less than 5 watts), Low Power (150 watts or less), High Power (over 150 watts), Multi-Transmitter QRP, Low Power and High Power. New Hampshire stations send RST and county; others send RST/state/province. DX stations send RST/serial number. Use of repeaters not allowed. Stations may be worked once per band per mode. Count one point per phone QSO, two points per digital QSO. Multipliers: NH stations—49 states, 10 NH counties, 13 Canadian provinces, 1 DX country; Non-NH stations—number of NH (10) counties worked. Suggested frequencies: CW—1.810, 3.535, 7.035, 14.035, 21.035, 28.035; Phone—1.875, 3.935, 3.950, 7.235, 14.280, 21.380, 28.390. Send logs postmarked no later than March 31, 2002 to NH-ARRL, P.O. Box 119, Goffstown, NH 03045-0119, or e-mail to <arrl@nhradio.org>. For more information and software go to <www. nhradio.org/nh-qso>.

North Carolina QSO Party – Sponsored by The Forsyth ARC, 1700Z Feb. 23 to 0300Z Feb. 24, 2002 (10 hours). There have been rule changes. For full details go to <http://www.w4nc.org>.

WA5DTK Special Event – From commemoration of the siege days at the Alamo, Round Rock, Texas; 0001Z Feb. 23 to 2359Z Mar. 6, 2002 on 7.265, 14.265, 21.265, 28.465. QSL to Barry Brewer, WA5DTK, 603 Broken Bow Dr., Round Rock, TX 78681-7401; e-mail: <wa5dtk@arrl.net>.

Special Event from U.P. 200 Sled Dog Championship – The Hiawatha ARA of Marquette County, Michigan will operate special event station K8LOD from race headquarters in conjunction with the 13th annual U.P. 200 from 2000Z Feb. 15 through 200Z Feb. 17 in the General portion of the HF bands. For a certificate send 9×12 SASE to Rich Schwenke, N8GBA, 21 Smith Lane, Marquette, MI 49855.

The following hamfests are scheduled for February:

Feb. 2, **Charleston Hamfest,** Stall High School, North Charleston, South Carolina. Contact Jenny Myers, WA4NGV, 843-747-2324; e-mail: <brycemyers@aol.com>. (Talk-in on 146.79, 145.25, 147.045)

Feb. 3, **Hiawatha ARA Swap & Shop**, Negaunee Township Hall, Negaunee, Michigan. Contact John, N8RSE, 906-228-9417, e-mail: <n8rse@chartermi.net>; or Bob, N8PKN, 906-226-9782, e-mail: <n8pkn@aol.com>. (Talk-in 147.27)

Feb. 3, **Northern Ohio ARS Winterfest 2002,** Gargus Hall, Lorain, Ohio. Contact John Schaaf, K8JWS, 216-696-5709; e-mail: <noars@qsl.net>; or write to NOARS Winterfest, P.O. Box 432, Elyria, OH 44036-0432. (Free pancake breakfast 8–11 AM; Talk-in on 146.700–, 444.800+)

Feb. 4, **West Valley ARC Equipment Auction,** St. Clement of Rome Catholic Church Social Hall, Sun City, Arizona. Contact WVARC, P.O. Box 1573, Sun City, AZ 85372 (phone 623-214-8136; e-mail: <w9jif@juno.com>). (Talk-in 147.30+, 162.2 Hz PL)

Feb. 9, **Cherryland ARC Swap-n-Shop,** Immaculate Conception Middle School, Traverse City, Michigan. Call Joe, W8TVT, 231-947-8555; or Chuck, W8SGR, 231-946-5312. (Exams; Talk-in 146.86)

Feb. 9–10, **Dixiefest 2002,** Shelby County Building, Middle South Fairgrounds, Memphis, Tennessee. Contact Ben, KU4AW, 901-372-8031; or Melinda, KE4DXN, 901-744-1737; on the web: <www.dixiefest.org>. (Riley Hollingsworth forum plus others; exams)

Feb. 10, **Richmond Frostfest 2002,** The Showplace, Mechanicsville Tpke., Richmond, Virginia. Contact Frostfest 2002, P.O. Box 14828, Richmond, VA 23221-0828 (804-790-0077, opt. 4); web: <www.frostfest.com>. (Talk-in 146.88)

Feb. 16, **Salem Hamfair,** Polk County Fairgrounds, Salem, Oregon. Contact Larry Quiring, KC7NOS, 503-585-8897; e-mail: <kc7nos@juno.com>; web: <http://www.qsl.net/w7sra/sraflyer.htm>.

Feb. 16, **AARC Fleamarket,** Marlborough Middle School, Marlborough, Massachusetts. Contact AARC, P.O. Box 258, Marlborough, MA 01752; website at N1EM.org.

Feb. 23, **LaPorte ARC Cabin Fever Hamfest,** LaPorte Civic Auditorium, LaPorte, Indiana. Contact Neil Straub, WZ9N, P.O. Box 30, LaPorte, IN 46352 (phone 219-324-7525; e-mail: <nstraub@worldkey.net>; web: <www.geocities.com/K9JSI/>. (Talk-in 146.52, 146.61–, PL 131.8)

Feb. 23, **Northern Vermont Winter Hamfest/ARRL Vermont State Convention,** Milton High School, Milton, Vermont. Contact W1SJ, 802-879-6589; e-mail: <w1sj@arrl.net>; <http://www.ranv.org>. (Exams at 9 AM and 1 PM; Talk-in 145.15, 146.67)

Feb. 24, **Winter LIMARC Hamfair & Electronics Show,** Levittown Hall, Hicksville, Long Island, New York. Contact Rich Rosner, N2STU, 631-563-1859; e-mail: <hamfest@limarc.org>; on web: <http://www.limarc.org>. (Exams 10 AM; Talk-in 146.85)

Feb. 24, **Cuyahoga Falls ARC Hamfest, Electronic, & Computer Show,** Emidios Party Center, Cuyahoga Falls, Ohio. Contact Ted Sarah, W8TTS, 330-688-2013; e-mail: <w8tts@arrl.net>.

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A publication of

CQ Communications, Inc.
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Offices: 25 Newbridge Road, Hicksville, New York 11801. Telephone: (516) 681-2922. FAX (516) 681-2926. E-mail cq@cq-amateur-radio.com. Website:http://www.cq-amateur-radio.com. CQ (ISSN 007-893X) is published monthly by CQ Communications Inc. Periodical postage paid at Hicksville, NY and additional offices. Subscription prices (all in U.S. dollars): Domestic—one year $31.95, two years $57.95, three years $83.95; Canada/ Mexico—one year $44.95, two years $83.95, three years $122.95; Foreign Air Post—one year $56.95, two years $107.95, three years $158.95. U.S. Government Agencies: Subscriptions to CQ are available to agencies of the United States government, including military services, only on a cash with order basis. Requests for quotations, bids, contracts, etc. will be refused and will not be returned or processed. Entire contents copyrighted CQ Communications Inc. 2002. CQ does not assume responsibility for unsolicited manuscripts. Allow six weeks for change of address.

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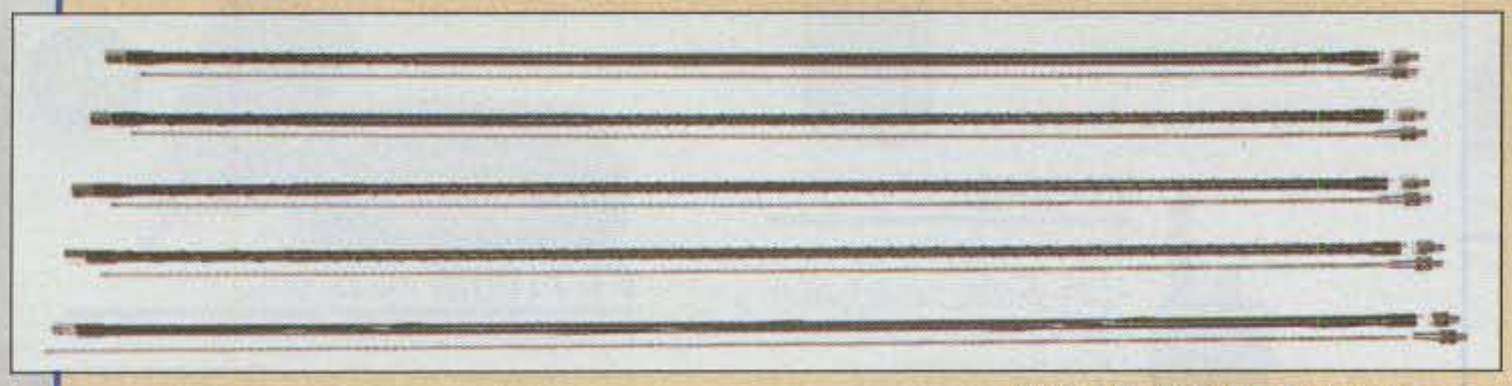

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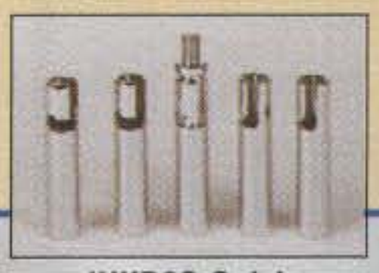

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Results of the 2001 CQ WW WPX SSB Contest

BY STEVE BOLIA,* N8BJQ

The 2001 WPX SSB Contest got off to a slow start but picked up steam midway through the weekend and finished with a bang. We didn't have a repeat of the fabulous 10 meter conditions of 2000 (darn!), but there was still plenty of action for everyone. There were some outstanding contest expeditions, good DX, lots of new prefixes, and plenty of Q's for all. In all, over 9600 different stations appeared in at least 20 logs and over 1.6 million QSOs were submitted.

The #1 World Multi-Multi international team: (left to right) back row: S56MM, W0UN, VE3EJ, K3EST, S53R, N4QB; front row: T97C, K2RED, N5KO, S50A, A61AJ, W3ZZ, UA9BA, and N2AA.

DX

N6KT at HC8A broke his 1992 Single Op All Band (SOAB) record by nearly 400K on his way to the world title. Rich averaged 180+ Q's for the entire contest period. Finishing second was Jim, W7EJ, at CN2R with a new African record. Third place went to P4ØV (AI6V), followed by 3V8BB (YT1AD), and Mike, KH6ND, with a new Oceania record. Tribander/Single-Element champ Koji, JM1CAX, at JY9NX was sixth; Olli, OHØXX, at 8R1K seventh; low power champion P4ØA (KK9A) eighth; JH5FXP ninth; and OK1RI tenth with a new European record.

9HØA was the 10 meter champion, with LP1F (LU5FC) second, LU2FA close behind in third, low power champ PP5JD fourth, and 5B4KH fifth. Fifteen meter honors went to EA8AH with a new African record. VB6A (VE5MX) took second, VC3X(VE3CKF) third, 9A3GW fourth, and 9M6A (G3MJS) fifth. The 20 meter title was closely contested, with FY5FY edging out VYØAA (VA5DX) for the win. 4O1B (YT1BB) was third, UA9MA fourth, and IU9S (IT9BLB) fifth. EA9LZ easily captured the 40 meter title with his near-record 6.7M point effort. Second place went to low power champion TA3J, with UA2FB third, S52O fourth, and UA9JDP fifth. S59CAB operated by S53MM was the 80 meter winner, followed by I4AVG, LZ8T, EK6CC, and AA1BU. Top-band honors went to 9A6A, with IQ3A (IV3TAN) second, 9A2VR third, UR6QA fourth, and OZ3SK fifth.

KK9A at P4ØA was the low power SOAB king with an outstanding 12.5M effort. Second place went to SU9ZZ, with VA3UZ third, ZX2B (PY2MNL) fourth, and AH7X/NH2 (JP1NWZ) fifth. Rounding out the top ten were GW7X (GW4BLE), VP5E (K6HNZ), KX8R (K8DX), AA3E (W3CF), and LRØN (LU2NI).

PP5JD was the low power 10 meter winner, with KP3A second, LU3HIP third, TI7/N4MO fourth, and LU4DX fifth. VE7SV took 15 meter honors, followed by RJ9J (RA9JR), YO4GAO, JL3VUL/3, and JR3RIY. WE1USA (WA1FCN) was the 20 meter champ, with W4SVO and 9A3B providing the main competition. TA3J set a new low power world record on his way to dominating the 40 meter category. On 80 meters T9ØU (T95MOJ) edged out S53F and T9/S57CQ for the top spot. Low power top-band honors went to 4N1A (YT1DX), followed by OK2SNX and G4VGO.

In the increasingly popular Tribander/Single-Element category JY9NX (JM1CAX) set a new world record that will be a tough one to beat. P4ØA (KK9A) took second place (a new South American record), with SU9ZZ third, USA champ NT1N fourth (a new U.S. T/S record), and CW6V fifth. Some great scores were turned in by our Rookie entries this year. Leading the way was Matt, KB9UWU, at K9ZO's fine station. Second place in the Rookie category went to ZL1TM, with RK9KWB third, SM6WQB fourth, and EU2DX fifth. 3W2KF (F5BPL) made the most of his frequency allocations to lead the Band Restricted category. JA5EO was second and S5MSU third.

NB1B topped the Single Op Assisted/with Packet category with nearly 7.5M points. OE4A was second, SO8ZZ (UY5ZZ) third, UZ7U (UT3UA) fourth, and DF6QV fifth. S5ØC (S53CC) was the 10 meter Assisted winner, followed by UUØA (UUØJX) and HA6NF. IR8A (I8QLS) took the 15 meter title, with 4O1Z (YT1RX) second. On 20 meters VE7NNN topped 9A7R for the number one spot. AM3ALV, UT7L (UXØLL), and YU1RA were the leaders on 40, 80, and 160.

LY5A (LY2PAJ) was the world QRP/p champion, followed by PQ2Q (PY2WC), TI5KD, LY9A (LY3BA), and TM9K. JA5GPJ was the 10 meter winner, RA9UAD the 15 meter winner, UA9AAZ for 20 meters, YO9GZU for 40 meters, SP3NGB for 80 meters, and UA9LAU the 160 meter champ.

USA

Year after year KQ2M dominates the U.S. SOAB category, and 2001 was no different. Bob's margin of victory was about 700K over KF3P, with WT6V (N6IG) third, WC4E fourth, and T/S champion NT1N fifth. KL9A at KM9P was sixth, K3ZO seventh, WB9Z eighth, NJ1F ninth, and KR1G in tenth place.

W4ZV at NY4A repeated as 10 meter champion, with N6RT at NE6N second and N4BP third. WZ1R was the 15 meter leader, followed by WW4RR (N4ZZ) and AD7J (W7FP). WE1USA was the 20 meter champ, with W4SVO second and N9HCA third. WK4R did a great job on 40 to get the win there, with AK6R second and KX9DX third. AA1BU and KE1Y were in the closest race for the 80 meter title with only 8K separating them. On 160 meters AA4MM repeated as the champ, with WIØWA (WØETC) second.

K8DX as KX8R was the low power SOAB champion with an impressive 4.3M effort. In second was AA3E (W3CF), with WA1S third,

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KS9K (N4TZ) fourth, and ACØW fifth. Rounding out the top ten were NX6T (K6AM), WS1A, KU4BP, N4IG, and W3SE.

NT1E (K3BU) was the low power 10 meter champion. Yuri mounted an expedition to Cape Hatteras, NC for the contest, and you can read about it in the Random Comments section. Second place went to WJ5DX, with K4WI third. NI9C edged out K2BQW for low power 15 meter honors, with W4LC very close behind. WE1USA and W4SVO were first and second in the low power 20 meter category, with AE1B third. KX9DX was the 40 meter champion, AJ7A (W7DD) was the 80 meter low power champ, and WIØWA (WØETC) took top-band honors.

NT1N was the Tribander/Single-Element winner with a new U.S. record. Dave was also fifth overall. Second place went to NA9D, with K9MOT (K9PW) third, N2ED fourth, and AI9U (K9JLS) fifth. In the low power T/S category NX6T (K6AM) edged out W3SE for the top spot, followed by WT1S, KW4T, and W3UJ.

The top U.S. Rookie (and also #1 in the world) was KB9UWU, who borrowed K9ZO's fine station and came away with a world title. Second place went to N6OPR, with KG4GSY third, KG6FFX fourth, and W2RDS fifth.

In the Single Op Assisted category NB1B was the U.S. and world winner. Second place in the U.S. went to NY6DX, with KV3R third, WN9O fourth, and K9NR fifth.

K3WW was the U.S. QRP/p champion, with NØKE second and KB3TS third. KX9X was the 10 meter winner, W6CN the 20 meter champion, and W6QU (W8QZA) the 40 meter QRP/p winner.

Multi-Ops

The Multi-Multi race was an interesting one. An international crew assembled at A61AJ's super station and all of the hard work paid off, as they topped South American champion ZX5J for the top spot. P3A took third, followed by WL7E and YW4M. NZ8O was the U.S. multi-multi champion, with NR6O not far behind in second, W4MYA third, WM2H fourth, and WR3L fifth.

The crew at ZXØF made a run at the Multi-Single record but came up just a bit short on their way to the top spot. Second place went to CQ9K with a new African record. North America champion FM5GU was third, followed by new European record holder TM5C fourth and TO5T fifth. NF4A was the U.S. Multi-Single winner, followed by WO8CC, NØNI, AI7B, and KG5U.

The Rest of the Story

The tragic events of Sept 11th and those which followed have changed the way we do business. As this is being written (the week before CQWW SSB), *CQ* has posted bulletins on several websites and internet reflectors urging electronic submission of logs if at all possible. Over 1500 SSB logs were e-mailed last year. Another 100 or so were received on disk via regular mail. The remaining 400–500 logs were paper logs received by mail. Of these, many were done on a computer and could have been e-mailed. *CQ*'s policy at the time this is being written is that mailed logs will not be refused, but will be held until it is felt that it is safe to open them. To ensure that your log arrives and is included in the results, please do your best to send it via e-mail (the addresses are listed below). It is probably cheaper for you, and safer because you will get a confirmation that your log has been received. If you don't have access to e-mail, perhaps one of your friends or someone in your local radio club would e-mail your log for you. If you must snail mail your log, please check the WPX website <http://home.woh.rr.com/wpx/> for current mailing instructions. We want your log and will make every effort to get it.

New database and log checking software written by WT4I was implemented for the 2001 contest. Bruce has done a tremendous job tweaking his software suite to handle lots of logs and has added several new features including serial number, operating time, and multi-single band change checks, as well as the normal UBN and NIL checking. The Cabrillo log format is used. Please, if possible, send your log in as Cabrillo and fill out the header information correctly. The information that goes into the results is extracted from the Cabrillo header and items in the wrong format are ignored, which will result in an error in your listing in the results. Your file must also contain both the sent and received serial number. Logs received without serial numbers will be rejected and counted as check logs. Non-Cabrillo logs have to be converted to Cabrillo prior to entry into the database. In some cases, this can be a painfully slow process, so submission of your log in Cabrillo format is *really* appreciated. A report file for each electronic log is generated for each entrant. If you would like a copy of your report, send me an e-mail at <n8bjq@erinet.com> and I will send it to you. Thank you, Bruce, for the great support!!

Serial number errors were not deducted from your score this year but will be in 2002. Please ensure that your log reflects the actual serial numbers sent by your station. After a quick analysis of the first year of automated serial-number cross checking, a large portion of the errors appear to be the result of transposing numbers. Take an extra second to make sure you type what you heard. Many of the same types of errors can be seen in the callsign cross checking.

Those of you who are claiming to be single ops but are actually using packet, beware. You could see your call at the end of the listings next year in the disqualified section. That's one place where most don't want to see their callsign placed. If you must use packet, then enter the Assisted category. If you spend the time necessary to try to beat the computer checking, you won't be competitive anyhow.

There will be a new e-mail address for log submissions starting with the 2002 contest. Please send your SSB logs to <WPXSSB@kkn.net> and your CW logs to <WPXCW@kkn.net>. Shortly after submission you should get a response from the robot acknowledging receipt of your log. In the subject line please

TROPHY WINNERS AND DONORS

SINGLE OPERATOR, ALL BAND

WORLD: Stanley Cohen, WD8QDQ Trophy. Won by **HC8A operated by Rich Smith, N6KT.**
World Low Power: Steve Bolia, N8BJQ Trophy. Won by: **P40A operated by John Bayne, KK9A.**
USA: Atilano de Oms, PY5EG Trophy. Won by: **Bob Shohet, KQ2M.**
USA Low Power: Oklahoma DX Assn. Trophy. Won by: **KX8R operated by Scott Detloff, K8DX.**
AFRICA: Peter Sprengel, PY5CC Trophy. Won by: **CN2R operated by Jim Sullivan, W7EJ.**
EUROPE: Jim Hoffman, N5FA Trophy. Won by: **Jiri Sanda, OK1RI.**
SOUTH AMERICA: Ron Moorefield, W8ILC Trophy. Won by: **P40V operated by Carl Cook, AI6V.**
CANADA Low Power: Amateur Radio League of Alberta Trophy. Won by **Yuriy Onipko, VA3UZ.**
OCEANIA: Philip Fraizer, K6ZM Memorial. Won by: **Michael Gibson, KH6ND.**
***JAPAN**: The DX Family Foundation Trophy. Won by: **Satoshi Hara, JH5FXP.**
WORLD QRP/p: Dayton Amateur Radio Association Trophy. Won by: **LY5A operated by Jonas Paskauskas, LY2PAJ**
USA QRP/p: Doug Zwiebel, KR2Q Trophy. Won by: **Charles Fulp, K3WW.**

SINGLE OPERATOR, SINGLE BAND

WORLD: John N. Reichert, N4RV Trophy. Won by: **Pekka Kolehmainen, EA8AH (21 MHz).**
WORLD 28 MHz: Alan Dorhoffer, K2EEK Memorial Trophy. Won by: **Jeff Morris, 9HØA.**
WORLD 7 MHz: William D. Johnson, KVØQ Trophy. Won by: **Jorge Pareja, EA9LZ.**
WORLD 3.7 MHz Low Power: Nilay & Berkin Aydogmus, TA3YJ & TA3J Trophy. Won by: **T90U operated by Admir Omerbegovic, T95MOJ.**
OCEANIA: D. Craig Boyer, AH9B Trophy. Won by: **9M6A operated by P.C.C. Broyer, G4MJS.**
USA 3.7 MHz: Lance Johnson Engineering Trophy. Won by: **Joe Gagliardi, AA1BU.**
USA – 14 MHz Low Power: Boomer Contest Club Trophy. Won by: **Gordon Muise, WE1USA.**
USA 21 MHz: Bernie Welch, W8IMZ Memorial Trophy. Won by: **Charlie Morrison, WZ1R.**

MULTI-OPERATOR, SINGLE TRANSMITTER

USA: Oklahoma Comm Center Trophy. Won by: **NF4A operated by N4PN, N4OX, NF4A.**
ASIA: W2MIG Memorial Trophy sponsored by Ed Campbell, NT4TT. Won by: **RF9C operated by RZ9CO, RA9CKQ, UA9CIR, UA9CDC, UA9CDT.**

MULTI-OPERATOR, MULTI-TRANSMITTER

WORLD: Gail Schieber, K2RED Trophy. Won by: **A61AJ operated by A61AJ, K3EST, N2AA, T97C, WØUN, W3ZZ, UA9BA, N5KO, VE3EJ, N4QB, K2RED, S50A, S56MM, S53R.**
NORTH AMERICA: Burt Curwen, KL7IRT Memorial Trophy (James Dixon, NL7HI sponsor). Won by: **WL7E operated by WL7E, KL7Y, KL2A, KL7FH, WA2GO, AL7PJ, KL5E, KL7CC.**
USA: Glenn Tracey, KC3EK Trophy. Won by: **NZ8O operated by K8CC, K8GT, KE8OC, KT8X, KU8E, N8MG, N8NX, N8VW, W8MJ, W8UA, WD8S.**

CONTEST EXPEDITION

WORLD: Kansas City DX Club Trophy. Won by: **ZXØF operated by PY5CC, PYØFF, N5FA, PY7ZZ.**

put your contest call and operating category and send your files as attachments. Naming the files with your call will greatly speed up the log processing. Check the WPX website for the 2002 contest rules and other WPX information.

As in previous years, many thanks to all who participate, as well as those who take the time to get a special contest prefix or go on an expedition. The special prefixes really help to make the contest fun and provide a big boost for the WPX award chasers. Thanks also to NA2X who again came through when called upon.

If you have not tried the WPX contest, give it a try in 2002. It's a fun weekend with chances for even the little pistol to generate a pile-up. If you do take part, please send in a log, no matter how small.

The 2002 SSB contest will be held as always on the last full weekend of March, the 30th and 31st. Again, please try to e-mail your log if at all possible. If you do need a copy of the summary or log sheet, they are available on the WPX website (again, <http://home.woh.rr.com/wpx/>). See you in the contest!

73, Steve, N8BJQ

Random Comments

Fun as always, but Saturday was my birthday and didn't have much time. . . . **4M5E**. QTH near Tokyo, Japan. Only had a few hours during vacation. . . . **7J1AOE**. I use TS-690S output 50 watts with 3-el monoband Yagi. . . . **7K2GMJ**. Thank you for nice contest. . . . **7K4XNN**. Extremely poor condx on Saturday. Picked up somewhat on Sunday. Missed a lot of central Europe; just did not hear them. Not many contest where I work as many VK's as DL's—hi. . . . **7S2E**. Used Writelog for the first time and it worked flawlessly. . . . **8P2K**. 300 W out + 5-el Yagi and hills on east side—not so bad. . . . **9A3MA**. Fairly good condx. . . . **AA6EE**. As usual a great contest. Gave up at 9:30 Sunday morning when I heard someone give QSO number 1040 and I realized I should be working on my taxes instead of playing radio!. . . . **AE6Y**. Friday night it took exactly 16 minutes to work all 16 of the stations I heard on 80 meters. On Saturday night I only heard N6RO. . . . **AI6V**. Fun contest! Certainly helps to have a unique prefix (AI9U); thanks, Dad, for the use of ur call! . . . **AI9U**. It is surprising how much fun you can have with 100 watts. . . . **AJ7A**. SOSB 40 from west coast is ham radio torture. Never again! . . . **AK6R**. With the sudden increase of sun activity and flux only a bunch of guys remained on 40. Everybody was gone to 10 and 15! After blowing an amplifier fuse (no spare) it was wonderful to see that 100 W and a vertical are still enough to jump across the Atlantic on 7 MHz. . . . **AM3ALV**. Nice contest. . . . **AN1COZ**. I just needed the first-issued CC prefix for my WPX Award. Next year I will appear as XR4M. 73 de Nancy. . . . **CE4MLN**. Great

WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

HC8A (N6KT)	25,180,199
CN2R (W7EJ)	20,530,495
P40V (AI6V)	18,699,401
3V8BB (YT1AD)	15,689,634
KH6ND	15,498,798
JY9NX (JM1CAX)	15,463,485
8R1K (OH0XX/EA4BQ)	12,657,035
*P40A (KK9A)	12,547,872
JH5FXP	10,903,389
OK1RI	10,844,592
KQ2M	9,668,020
V47KP (W2OX)	9,631,712
*SU9ZZ	9,411,864
OT1T (RA3AUU)	9,130,968
KF3P	8,996,976
PJ2WI (WI9WI)	8,987,348
9K9X (9K2HN)	8,724,652
WT6V (N6IG)	8,547,549
OD5/OK1MU	8,438,528
WC4E	8,215,398

28 MHz

9H0A	8,166,158
LP1F (LU5FC)	7,785,953
LU2FA	7,728,915
*PP5JD	7,599,774
5B4KH	5,400,687
JR6EZE	5,078,745
JH7PKU	4,842,502
9K9Z	4,771,584
*KP3A	4,473,568
NY4A (W4ZV)	4,387,366

21 MHz

EA8AH	12,387,139
VB6A (VE5MX)	7,925,940
VC3X (VE3CKF)	5,261,694
9A3GW	5,177,168
9M6A (G3MJS)	5,052,699
VE3ANX	4,749,381
SP3GEM	4,680,888
JI3OPA	4,516,864
4O7A (YU7AV)	4,222,492
*VE7SV	4,032,726

14 MHz

FY5FY	5,518,910
VY0AA (VA5DX)	5,238,948
4O1B (YT1BB)	4,702,538
UA9MA	4,501,518
IU9S (IT9BLB)	3,794,624
SN8V (SP8GQU)	3,069,080
EO3Q (UR3QCW)	2,544,060
YZ9A (YU7NU)	2,543,372
VE6JY (VE7AV)	2,511,553
*WE1USA (WA1FCN)	2,422,176

7 MHz

EA9LZ	6,714,062
*TA3J	2,617,428
UA2FB	2,227,795
S52O	2,102,544
UA9JDP	1,999,283
4O7M	1,947,699
OM5M	1,596,928
DJ4PT	1,478,932
RW9HZA	1,153,676
WK4R	1,097,848

3.7 MHz

S59CAB (S53MM)	1,064,700
I4AVG	876,024
LZ8T	705,320
EK6CC	703,290
AA1BU	638,577
YT0T (YU1EA)	633,556
KE1Y	629,442
4N1KW	497,080
S58M	468,882
9A5AZZ	450,822

1.8 MHz

9A6A	453,924
IQ3A (IV3TAN)	355,770
9A2VR	232,050
UR6QA	185,719
OZ3SK	168,520
LY2BM	151,107
*4N1A (YT1DX)	123,000
OK1TP	101,936
*OK2SNX	99,372
LA6WEA	62,064

LOW POWER ALL BAND

P40A (KK9A)	12,547,872
SU9ZZ	9,411,864
VA3UZ	7,994,840
ZX2B (PY2MNL)	6,712,550
KH0/JM1LRQ	6,685,416
AH7X/NH2 (JP1NWZ)	6,577,208
GW7X (GW4BLE)	6,225,688
VP5E (K6HNZ)	6,111,512
KX8R (K8DX)	4,392,350
AA3E (W3CF)	3,866,880
LR0N (LU2NI)	3,804,600
ZC4BS	3,690,756
S53EA	3,606,975
9G5MD (F5VCR)	3,534,993
4O7B	3,375,567
SU1HR (RN3OA)	2,706,341
8P2K (8P6SH)	2,686,418
RA9ASA	2,627,622
UA4FER	2,582,270
ED3BOX	2,517,900

28 MHz

PP5JD	7,599,774
KP3A	4,473,568
LU3HIP	4,342,140
TI7/N4MO	3,493,952
LU4DX	3,365,152
LT0H (LU3HY)	2,938,806
YU0A (YU1DX)	2,708,524
NT1E (K3BU)	2,695,974
CT1EEN	2,679,974
9A2RD	2,281,530

21 MHz

VE7SV	4,032,726
RJ9J (RA9JR)	2,138,080
YO4GAO	1,752,598
JL3VUL/3	1,699,320
JR3RIY	1,553,464
UA0FDX	1,491,976
JA7NVF	1,189,024
HG3DX (HA3UU)	1,081,350
DL2DBH	1,017,609
AN7HBP	962,580

14 MHz

WE1USA (WA1FCN)	2,422,176
W4SVO	1,730,283
9A3B (9A1AA)	1,701,664
RW9AB	1,434,234
RV9JR	1,300,109
9A2L (9A4GD)	1,273,419
IT9ICS	871,200
DF7YU	736,971
AE1B	668,680
T94DO	639,431

7 MHz

TA3J	2,617,428
US0HZ	196,272
PV8DX	162,333
KX9DX	110,780
CT1CAD	98,600
DJ2YE	77,425
CT2GBK	64,575
OK2PPM	63,504
VE3OIL	56,286
OK1TGI	53,958

3.7 MHz

T90U (T95MOJ)	407,640
S53F	385,789
T9/S57CQ	383,320
OK1FPS	354,000
EU1AZ	334,125
OK2ZV	290,920
UR3HC	289,640
T98R	188,020
AJ7A (W7DD)	90,712
UT4TA	88,605

1.8 MHz

4N1A (YT1DX)	123,000
OK2SNX	99,372
G4VGO	49,950
VY2MGY/3	44,082
WI0WA (W0ETC)	28,997
LZ5UU	24,700
LZ1UQ	20,880
S54A	17,056
YU1AST (YT1CA)	13,275
EU6DX	5,824

TRIBANDER/SINGLE ELEMENT

JY9NX (JM1CAX)	A	15,463,485
*P40A (KK9A)	A	12,547,872
*SU9ZZ	A	9,411,864
PJ2WI	A	8,987,348
NT1N	A	7,535,020
CW6V	A	6,875,565
*ZX2B (PY2MNL)	A	6,712,550
*KH0/JM1LRQ	A	6,685,416
*AH7X/NH2 (JP1NWZ)	A	6,577,208
S51TA	A	5,310,375
VE1OP	A	5,262.972
HA8JV	A	4,880,343
IU4T	A	4,795,440
VO1WET	A	4,629,440
*LR0N (LU2NI)	A	3,804,600
RA3AJ	A	3,728,760
AN6AEQ	A	3,553,656
*9G5MD (F5VCR)	A	3,534,993
PY4VB	A	3,319,821
NA9D	A	3,197,016
ER6A (ER1LW)	A	3,157,035
LY2IJ	A	2,983,992
NJ2F (WB2WIH)	28	538,992
OH6NJ	28	445,872
*IO7C (I7PXV)	28	383,308
*PA0MIR	28	313,100
*UA9JQN	28	274,256
9M6A (G4MJS)	21	5,052,699
*JA7NVF	21	1,189,024
LY2OX	21	999,186
*JR9NVB	21	736,533
*PT2AW	21	253,750
KG0ZI	14	1,213,835
RA6LBS	14	1,104,037
VE4IM	14	579,111
OH3BU	3.7	148,780

BAND RESTRICTED

3W2KF (F5PBL)	A	2,215,218
*JA5EO	A	775,008
*S57MSU	A	708,995
*S57NRO	A	581,600
*LW7EGO	28	506,025
*UA9JQN	28	274,256
*ES6KW	A	211,862
*OM2AWX	A	194,360
*JA1BMS/1	A	185,148
*AN7BDL	A	182,210

ROOKIE

K9ZO (KB9UWU)	A	3,494,172
*ZL1TM	A	2,184,138
*RK9KWB	A	1,904,628
SM6WQB	A	1,089,414
EU2DX	A	706,860
N6OPR	A	584,658
*CT3KN	14	569,976
*4N1N	21	559,994
*KG4GSY	A	524,755
*KG6FFX	A	505,557
RZ3RC	A	490,266
*OK2INW	A	478,201
*OK2CMW	A	476,840
RZ1AK	3.7	366,048

ASSISTED

NB1B	A	7,463,666
OE4A	A	5,958,738
SO8ZZ (UY5ZZ)	A	5,043,676
UZ7U (UT3UA)	A	4,057,773
DF6QV	A	3,386,194
NY6DX	A	3,245,190
OI5AX (OH2JTE)	A	3,013,794
KV3R	A	2,787,855
WN9O	A	2,361,928
S50C (S53CC)	28	3,354,024
UU0A (UU0JX)	28	2,184,483
HA6NF	28	1,824,075
W0TM	28	408,148
KO4MR	28	392,763
IR8A (I8QLS)	21	3,481,720
*ZV2V	21	1,394,582
4O1Z (YT1RX)	21	1,264,839
*WZ7ZR (W7ZR)	21	1,216,584
RK6CZ	21	1,065,572
VE7NNN	14	4,668,625
9A7R	14	3,386,251
LX7I	14	2,261,246
4O1J (YU1JW)	14	2,210,222
AM3ALV	7	82,164
UT7L (UX0LL)	3.7	818,571
*IC8JAH	3.7	226,931
*YU1RA	1.8	4,888

QRP/p

LY5A (LY2PAJ)	A	1,971,592
PQ2Q (PY2WC)	A	1,801,785
TI5KD	A	1,488,888
LY9A (LY3BA)	A	1,278,936
TM9K (F5BEG)	A	1,206,038
K3WW	A	1,091,168
HG5Z (HA1CW)	A	1,067,556
N0KE	A	982,977
YU1KN	A	795,150
KB3TS	A	641,646
JA5GPJ	28	709,758
UP6F (UN7FZ)	28	551,551
FB1BON	28	470,649
KX9X	28	387,368
NA4CW	28	358,237
RA9UAD	21	420,480
LY5G (LY2FE)	21	199,584
YT7TY	21	104,804
LU5FZ	21	98,532
LU3DR	21	73,312
UA9AAZ	14	309,319
IU2R (IK2BCP)	14	83,266
W6CN	14	77,056
OK2BAT	14	41,600
BA4TB	14	36,414
YO9GZU	7	13,464
W6QU (W8QZA)	7	10,679
SP3NGB	3.7	1,794
AM3CKX	3.7	1,508
UA9LAU	1.8	3,672

MULTI-OPERATOR SINGLE TRANSMITTER

ZX0F	31,700,536
CQ9K	26,146,204
FM5GU	19,260,780
TM5C	17,220,474
TO5T	17,203,704
VP5V	16,578,672
IR4T	16,123,620
RF9C	14,207,193
AM8CI	14,199,840
UP0L	13,894,586
9A7A	13,803,528
SN2B	13,298,688
TO9T	12,667,578
TM2Y	12,211,458
HG1S	12,181,928
VE5TP	11,810,564
RW0A	11,773,384
ES5Q	11,094,530
LV5V	11,086,845
RT9W	10,768,039
TM2V	10,750,545
LU1NF	10,574,700
OT1C	10,461,035
NF4A	10,394,208
VE3RM	10,158,014
OM7M	10,085,637
EA8KK	9,734,156
OH1F	9,626,337
WO8CC	9,435,188
LU5FB	9,319,768

MULTI-OPERATOR MULTI -TRANSMITTER

A61AJ	51,659,150
ZX5J	46,185,516
P3A	42,728,368
WL7E	35,617,140
YW4M	35,085,817
KL7RA	34,081,690
OT1A	31,830,425
HG6N	25,576,092
RU1A	25,152,028
S50S	25,047,270
NZ8O	21,485,294
TX8G	19,842,004
NR6O	19,149,390
Z39A	18,390,528
L40F	18,176,808
ED4URE	17,705,721
W4MYA	15,862,083
LY7A	15,629,124
VE5RI	13,273,806
WM2H	13,211,358
VE6FI	13,066,200
PY3MHZ	11,166,096
OL7R	6,812,588
J41K	5,781,672
OH6K	5,163,868

**Low Power*

USA TOP SCORES

SINGLE OPERATOR ALL BAND

KQ2M	9,668,020
KF3P	8,996,976
WT6V (N6IG)	8,547,549
WC4E	8,215,398
NT1N	7,535,020
KM9P (KL9A)	7,221,522
K3ZO	6,739,460
WB9Z	6,655,456
NJ1F	6,410,495
KR1G	6,031,480
K6NA (N6ED)	6,031,405
WC6H (NU6S)	5,269,056
K7RI	5,105,888
W3BGN	4,499,955
W5WMU	4,412,683
*KX8R (K8DX)	4,392,350
WO4O (KØEJ)	4,067,200
*AA3E (W3CF)	3,866,880
K9ZO (KB9UWU)	3,494,172
K4VUD	3,313,676

28 MHz

NY4A (W4ZV)	4,387,366
NE6N (N6RT)	3,112,500
N4BP	3,008,460
K9NW	2,808,300
*NT1E (K3BU)	2,695,974
WZ5V (WD4K)	2,249,585
WM5R	2,120,202
*WJ5DX (W5AJ)	1,796,790
N3HBX	1,774,440
KKØSS	1,637,767

21 MHz

WZ1R	3,539,448
WW4RR (N4ZZ)	2,720,163
AD7J (W7FP)	1,955,253
WA7LT	1,184,040
NX5M	506,800
*NI9C	348,096
*K2BQW	337,006
KK1H	299,098
*W4LC	290,766
K6JAT	227,942

14 MHz

*WE1USA (WA1FCN)	2,422,176
*W4SVO	1,730,283
N9HCA	1,504,800
KGØZI	1,213,835
*AE1B	668,680

7 MHz

WK4R	1,097,848
AK6R	224,640
*KX9DX	110,780
*KU6T	16,184

3.7 MHz

AA1BU	638,577
KE1Y	629,442
*AJ7A (W7DD)	90,712

1.8 MHz

AA4MM	58,032
*WIØWA (WØETC)	28,997
*KØCS	2,940

LOW POWER ALL BAND

KX8R (K8DX)	4,392,350
AA3E (W3CF)	3,866,880
WA1S	2,440,704
KS9K (N4TZ)	2,022,122
ACØW	1,865,952
NX6T (K6AM)	1,853,390
WS1A	1,709,372
KU4BP	1,481,276
N4IG	1,478,950
W3SE	1,390,480
N4NX	1,342,548
N8CN	1,340,598
WT1S	1,334,272
KW4T	1,308,075
W3UJ	1,303,542

28 MHz

NT1E (K3BU)	2,695,974
WJ5DX (W5AJ)	1,796,790
K4WI	1,262,352
W6AFA	875,811
KC6AWX	447,474
WA2YJF	328,860
K9QVB	271,776
KB7XL	238,134
KD9AC	134,844
W6FFH	97,053

21 MHz

NI9C	348,096
K2BQW	337,006
W4LC	290,766
KC2Q	140,448
NI4S	31,694

14 MHz

WE1USA (WA1FCN)	2,422,176
W4SVO	1,730,283
AE1B	668,680
NN5Z	205,200
NP4IW/WT6	194,032

7 MHz

KX9DX	110,780
KU6T	16,184

3.7 MHz

AJ7A (W7DD)	90,712

1.8 MHz

WIØWA (WØETC)	28,997
KØCS	2,940

TRIBANDER/SINGLE ELEMENT ALL BAND

NT1N	7,535,020
NA9D	3,197,016
K9MOT (K9PW)	2,932,764
N2ED	2,194,908
AI9U (K9JLS)	2,006,875
K4BAI	1,866,480
*NX6T (K6AM)	1,853,390
WB8TLI	1,834,555
*W3SE	1,390,480
*WT1S	1,334,272

LOW POWER

NX6T (K6AM)	1,853,390
W3SE	1,390,480
WT1S	1,334,272
KW4T	1,308,075
W3UJ	1,303,542
WN6K	1,204,533
WS7V	1,167,572
K4BEV	1,155,096
KD4RWN	1,144,503
NQ4U	1,098,192

ROOKIE

K9ZO (KB9UWU)	3,494,172
N6OPR	584,658
*KG4GSY	524,755
*KG6FFX	505,557
*W2RDS	273,408
N4YQ	254,907
WØDET	171,402
*W6NS	55,042
*K8KHZ	50,232
*KB9VSG	6,372

ASSISTED ALL BAND

NB1B	7,463,666
NY6DX	3,245,190
KV3R	2,787,855
WN9O	2,361,928
K9NR	2,096,823
W2WB	1,549,976
N1RK	1,310,475
K4YT	1,284,248
N1NQD	1,075,986
W6TK	1,063,868
NM5O (N5UM)	1,027,520
*W2GG	979,215
WW6O	968,060
*NA1DX	933,092

28 MHz

WØTM	408,148
KO4MR	392,763
N5MT	155,350
*K9GY	20,706

21 MHz

*WZ7ZR (W7ZR)	1,216,584
N9LCR	229,338
*K1SE	40,086

QRP/p

K3WW	A	1,091,168
NØKE	A	982,977
KB3TS	A	641,646
WG1Z	A	319,663
KKØQ	A	310,752
KX9X	28	387,368
NA4CW	28	358,237
WA6FGV	28	126,654
N2JNZ	28	107,460
WR6WR	28	78,200
W6CN	14	77,056
K3TW	14	24,360
WB7OCV	14	10,336
K7KY	14	6,174
W6QU (W8QZA)	7	10,679

MULTI-OPERATOR SINGLE TRANSMITTER

NF4A	10,394,208
WO8CC	9,435,188
NØNI	7,678,888
AI7B	7,123,896
KG5U	6,727,488
WZ6E	6,429,384
W6XR	6,153,728
NZ1U	5,432,805
KY4AA	4,929,899
AE9B	4,693,986
NT6K	4,472,280
KD9ST	4,417,985
W7VJ	4,072,503
KØDU	3,752,325
ABØS	3,076,528

MULTI-OPERATOR MULTI-TRANSMITTER

NZ8O	21,485,294
NR6O	19,149,390
W4MYA	15,862,083
WM2H	13,211,358
WR3L	4,551,692
AK3Z	3,330,972

**Low Power*

conditions to Europe for my first operation from Africa! . . . **CN2R**. Had to go to QRL on Saturday morning; tried to make as many QSOs as possible anyway! . . . **DF1ZN**. 460 QSOs and 1022 QSO Points × 324 Mult = 331,128 Points. Is not one of the high scores, but was fun to be part of the game. I have to go for the high power category as I used the amp for 5 QSOs. . . . **DF7ZS**. Tnx to DF3CB, who let me use his station. . . . **DL4MCF**. Had some serious RF interference problems into my keyboard which kept me busy but had much fun anyway. . . . **DL7AOS**. It's hard business on 160 with a matched GAP Titan and 75 watts only. . . . **DL8AAE**.

The contest was indeed a successful one even though there's a lot of QRM on my side. It takes me many times to fix my station due to some weather disturbance. MABUHAY! from the Philippines. . . . **DX1E**. Great conditions Sunday afternoon in 10 meters. Incredible! Almost 900 consecutive QSOs with North American stations from 1200Z to 1900Z. Thank you to all of them. . . . **EA1EEY**. The contest is a great experience to work other countries. . . . **EA3DUZ**. This is my second WPX. I could not work all time contest as last year. I hope I can work more hours the next WPX contest. . . . **EA7FRX**. I participated as single operator Band Restricted (only 28.9–29.1 MHz). I made this archive with a homemade program. I hope make many QSOs this contest hi hi. I work with 10 W and vertical antenna. Please (for the next contest) in 28900 kHz we are many rookie stations (novices)—go up, TNX. . . . **EF7AMD**. Great to get Alaska. . . . **EI2CH**. Condx not as good as 2000 but still pretty good, especially the Sunday (SFI = 219!). . . . **EI7GL**. Part of time worked low power; problem with electricity in north Moldova. . . . **ERØND**. Thanks for FB contest! . . . **ER5OK**. Just a quick entry whilst on a shopping trip to France. Amazing what can be worked with a mobile whip and 5 W. . . . **F/G3VQO/P**. I had a lot of fun using the local club's callsign although it was surprising how hard it was to convince people I was a "G 2 + 2 letter" call; at least my own call is in most check partials. Maybe it will be easier next year?! Conditions here seemed quite poor until Saturday afternoon and then much improved on Sunday. I guess the highlight for me was being called by KH6's. I remember how hard I had to work originally to get one for WAS. Plus it was good to make more QSOs and prefixes than I had ever previously, ending up with my highest ever score. Now if I could only convince my neighbours a tower and bigger aerials would look really pretty—*fat chance!!*. . . **G2TO**. First entry in WPX. Had a great 12 hours on 160/80 with 105 ft. vertical. . . . **G3UEG**. Had to work over the weekend so time available was limited. Still great fun! CU next year. . . . **G3UFY**. Fantastic conditions from the mobile at the peak of the sunspot cycle. The most contacts that I have ever made /M in CQ WPX! . . . **G4NXG/M**. Rig: FT901DM. 100 W where the match enabled me to load to 250 mA! Ant.: Single dipole in roof space (20 ft. agl) for 10/15 m (equally poor on both bands; must be well detuned!). . . . **G4PIQ**.

Saturday's conditions were terrible thanks to the aurora on Wednesday; conditions were better (not a lot) on Sunday. Used the N1MM software; it ran perfectly. . . . **G4UJS**. No propagation from Europe to North America, Asia, or *anywhere!* . . **G4VGO**. Just a part-time support operation for Contest Cymru club entry: GW7X *et al* SSB. . . . **GW3NJW**. This was the first operation of the GW7X callsign, issued to "Contest Cymru," a group of like-minded contest enthusiasts located in Wales. I operated single-op from my home station. Go to <GW7X.org> for info. . . . **GW7X**. Thoroughly enjoyed the contest. We could not operate for the full length of the contest. Also we were limited to three bands. We think we did pretty well considering we operated for less than 24 hours and had only the three bands. I hope we can gather enough ops. . . . **GX4NOK**. A lot of fun but the condx have not been that good. . . . **HB9IQY**. Very nice surprise from sun. Sunspot figures never been so high all this year and I could enjoy lot of fine contacts with low power. Unfortunately I did not operate full time to avoid wife QRM—hi. . . . **IR4B**. My first CQ WPX Contest, a lot of people. Nice! . . . **IZØBVU**. Good condition on 10 m band. . . . **JA1VBP**. Tnx nice contest. . . . **JA2BQX**. This is my first entry in CQ WPX SSB. . . . **JA3AOP**. QRP is great!! . . . **JA3LFK.** Condx were bad more than last year but enjoyed. . . . **JA6BGA**. Will be back in next year. . . . **JA6ZPR**. Last record-breaking year I missed the WPX SSB. . . . **JA8RWU**. Very nice contest! . . . **JH6FTJ**. Due to rotator problem gave up SOAB this year. Still enjoyed SO 10 m instead. . . . **JH7PKU**. First entry. . . . **JR3IAL**. I have to cut the operation because of earthquake but not so serious damage. . . . **JR4QZH**. First Cabrillo log. . . . **KØCS**. First WPX. Fun. First "live-fire exercise" with Windoze contest software. Going back to CT. First Assisted contest—like kissing your kid sister. . . . **KØHB**. My first WPX contest! You've got me hooked now! . . . **K1SWG**. A61AJ: A super station and a great group of dedicated, caring operators with whom to learn and share the art of contesting. My thanks to Ali, A61AJ, and Bob, K3EST, for the opportunity. It was a wonderful experience (again). . . .**K2RED**. Nice conditions. This was the best I have ever done in this contest. . . . **K3MZ**. It was fun to work all continents on 14 MHz with just 5 watts. Great conditons. . . . **K3TW**. Tried to go low impact—QRP. Less than ten responses to CQ all weekend. Fun to have a chance to listen to what is going on. . . . **K3WW**. The week leading up to the contest was windy and dry so the line noises were out in full force. . . . **K3ZO**.

I felt like I had many friends in many countries. . . . **K4AHC**. Finally broke 1M! . . . **K4BEV**. Lots of signals even at night. Might have had a great score if I had worked Sunday. . . . **K4RFK**. Slow going at first due to high *A*-index, but by Sunday things were picking up nicely! Thanks everyone. . . . **K4WI**. I did improve my score from last year by over 1000X. More hours. Great contest and thanks to all the folks who make it possible. . . . **K5RA**. City noise was horrible this year. . . . **K7RI**. What? I must be dreaming!! It's a contest weekend and no S9 QRN! This was my first WPX and it was lots of fun. Many thanks! . . . . **K8FK**. Not bad for a kid in an apartment/condo with a vertical and no linear. . . . **K8IKW**. Closed on new home; may have not been 12 hours. . . . **K8KHZ**. 10 meters was great the whole weekend. Surprised to have 9K2 and A9 stations call me. Enjoyed the entire weekend. . . . **K8OSF**. My first WPX contest! . . . **K9DDS**. The Elecraft K-2 held its own against the big guns. . . . **K9FOH**. First time with Writelog from home. Got radio, telnet, and WL working together. Just giving out some points and spotting. . . . **K9GY**. What a great showing for a Rookie! He's not old enough to drive. . . . **K9ZO**. Thanks for a great contest; even picked up a couple of new ones! . . . **KB2EOQ**. First real run and entry for a contest. Hardest part was hacking together a file in Cabrillo format. Why doesn't someone make a good contesting log for the Mac? . . . **KB7XL**. Worked 21 MHz for the first time. . . . **KB9VSG**. Butternut vertical for 10, 15, 20. . . . **KCØJQJ**. Short operating hours this year but still had fun. . . . **KC7WUE**. Headset/foot switch kaput; used hand mic. Laptop died; did hand logging. Still had a great time! . . . **KC8HWV**. Could only op about 22 hrs at my university club station (K4UCF). Did have a great time for the period I was on the air. . . . **KD4RWN**. Second contest I have participated in! Great! . . . **KD5FQF**. SFI = 219: A = 15: K = 1. First time breaking 400 Q's in a contest. What a blast! But what happened to 20 meters?. . . . **KD6DAE**. QSO with several new entities. . . . **KD9AC**. Thanks, Tam!. . . . **KD9ST**. I liked calls

Stereo SSB and CW? Yes! (and more!)

A "Must Have" Station Accessory!

AOR's new Multi-Media Terminal (MMT) is a powerful new tool to add to your station. More than just DSP, transmit and receive PSK31 and RTTY, listen to amazingly clear audio, equalize your mic, apply potent filtering and hear "weak ones" others may miss.

AOR MMT TDF-370

- Derived Stereo SSB and CW signals are incredibly clear.
- Use powerful DSP noise reduction and filtering technology, including Fast Fourier Transform.
- Decode and display PSK31 or RTTY, on the LCD panel, no external PC required!
- Enhance your transmitted audio with 8 channels of mic equalization.
- Digitally record up to 102 seconds of audio in up to 8 memories.
- Receive SSTV 56.7 kHz (external PC and software needed for viewing).

AMAZING AUDIO

With a new Fast Fourier Transform audio filter, the MMT applies DSP filtering and creates a more "natural" sound, pleasing to the listener. Line enhanced noise reduction uses new algorithms to dramatically reduce background noise. An auto-notch function can be used to reduce or eliminate annoying interference. You won't believe your ears!

"HIGH FIDELITY" SSB

This is not a conflict of terms! AOR's unique technology derives unbelievable audio from a 2.4 kHz source in simulated stereo, through the provided headphones. The results are amazing and have been compared to "FM quality" reception. You didn't know your radio could sound this good. Just about everyone who hears it says, "Wow!"

BETTER TRANSMITTED AUDIO

Use the built-in microphone equalizer to enhance your transmitted audio. Contour a profile for your vocal characteristics or overcome some of the limitations that may exist in your microphone.

IMPROVED CW OPERATION

Built-in 100, 200 and 300 Hz audio band pass filters. Center frequency is adjustable from 800 Hz with 450 Hz pitch. There is also a special noise reduction circuit just for CW operation.

"STEREO" CW RECEPTION

The built-in band pass filter has independent outputs for the left and right channels, allowing independent bandwidth settings heard through the included stereo headphones.

DIGITAL MODES WITHOUT A PC

Receive and display PSK31 and RTTY (Baudot) modes without the need for a PC. AOR's MMT displays text on its easy-to-read LCD display. PSK31 formats include BPSK and QPSK. RTTY operations include 170, 425 and 850 Hz shifts.

PC INTERFACE

The MMT has a rear panel DSUB9 connector and a serial cable is provided. You can set internal parameters of the MMT and operate PSK31 and RTTY using a simple terminal program. You can also transmit and receive SSTV (56.7 kHz) through your computer (optional software needed for SSTV).

DIGITAL VOICE RECORDER (DVR)

Capture up to 102 seconds of audio, in as many as 8 memories, in the MMT's DVR. DPCM compression saves space and delivers good fidelity.

POWER MISER

The AOR MMT operates with just 4 internal AA batteries or from a regulated external supply of 9 – 15 VDC.

ACCESSORIES INCLUDED

With the AOR MMT, you get: input cable, stereo connectors, 8-pin mic connectors, power cable, stereo earphones and serial cable for connection to a computer. Note: some soldering of wires and connectors may be required to adapt your transceiver's mic and mic input with the MMT. No alteration to your existing equipment is necessary.

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info@aorusa.com • www.aorusa.com

Specifications subject to change without notice or obligation.

The ops at trainee station DN1MA. In the background are Markus (7 years old) and Michi (age 10); in the foreground is Robert, age 12. Michi and Robert soon will take their exams for the Class 3 license. If they are successful, they will get a DO prefix call.

The operators of OL5T, who entered the Multi-Multi category this time.

like M2M and P2P. . . . **KE1F**. Great contest. I wish I had more time to operate. Can hardly wait for next year. . . . **KE4UHO**. The contest got me back into the shack after two years of very little activity. Tnx for the fun! . . . **KE4W**. Like the 1 pt. rule. . . . **KF2O**. 15 meters open til 1030 local time with a pipeline to JT. . . . **KF8UN**. I didn't have much time to operate but had a great time!. . . . **KG1V**.

It was my first time in the contest. I had a great time and was glad 10 opened on Sunday. I hope the log format is okay. I am not sure about the scoring. . . . **KG2MV**. I've only had my license one month. I used all my own equipment at my QTH that I set up myself without any assistance. I only used a vertical ground plane antenna and a barefoot rig. I had a great time and learned a lot. I will do a lot better next time. . . . **KG6FFX**. I was just recently licensed. The contest blew me away—so many amateur radio operators on the air at the same time. Talk about a target-rich environment. . . . **KG6FOD**. Fun contest. . . . **KG7WZ**. This was my first participation from another DX entity. Nice condition on 10 and 15 m bands between Europe and KHØ. I'm so glad to break a world record of SO (TS) ABLP. . . . **KHØ/JM1LRQ**. Very poor start with bright aurora overhead. Stopped contesting to eat arctic WPX soup made with WB5WWW/WB3 QSL. Signals came back soon after, ran to the end, zero problems. . . . **KL7RA**. Ban ragchewers during contests! . . . **KM8I**. My first SOAB in an SSB test. Lots of fun despite being sick. Thanks to Bill, W4AN, for letting me use his place. . . . **KM9P**. Conditions on 10 m were much worse than last year on the first day of the contest. No JA's were audible on Friday night and Europe was weak on Saturday morning. The situation improved by Saturday night and Sunday was excellent with very nice openings worldwide. . . . **KO4MR**. Didn't sleep the night before fighting an impending flood in the basement (I won). Slept 2 hours Friday, and had to take off most of Sunday. Great time, but starting an SSB contest dog tired is *not* good. Condx in the dumps for the first 30 or so hours. . . . **KR1G**. The LP category has certainly changed in this year's contest season, as super stations K1ZM, K4XS, VE3EJ, and now K8DX have dropped into the "neighborhood"! Apparently, the top scores are down a little this year from last year. My score would have been #5. . . . **KS9K**. My first ever WPX. Wow do I like this contest! One of my favorite hamfests was always the same weekend, but not this year. . . . **KV3R**. My first time of operating low power in a DX contest and it has its own level of skill. I think I'll turn on the amplifiers next time. . . . **KX8R**.

The new M/S category requires 3 dB more hardware, 3 dB more operators, results in 6 dB more drudgery from tuning unproductive bands, and causes 10 dB more headaches in serial number coordination. To be fair, I would compare this against the benefits of the new rule, but none come to mind! . . . **KY4AA**. Very bad conditions for DX on 80 this year. See you all again next year! . . . **LA6EIA**. Nice contest with many stations; we enjoyed it. Much noise in low bands. Tnx to Steve and Raul to share my station. Many thanks to all stations we contacted. . . . **LV5V**. Could hardly hear any NA the first day; second day opened late in the evening, finally. This is a contest session to forget about quickly. . . . **LX4A**. Part-time operation as usual, but no sorrow due to this as condx was disappointing. . . . **LY2OX**. Broken (so no) rotator all contest. High solar activity seemed to result in poorer than usual conditions. . . . **M4U**. Long weekend but great pity about the huge solar activity killing 10 m. . . . **MUØFAL**. Woke up Saturday morning and someone had actually stolen my 80/40 m wires, the pole, and all my coaxial. Never again will I operated from my parents' back lane. I did enjoy the time I was able to use my proper antennas though! Also propagation was not good. . . . **MW5EPA**. First time as General Class. Got to get up on 80 and 160 and upgraded to Extra. . . . **NØYYO**. Two watts work the world! . . . **N2JNZ**. I was plagued by power line noise which made it hard to hear, especially in the direction of JA. Band was up and down all the time during daylight hours (QSB). Very few DL's, SM's, or OH's worked owing to poor propagation into northern Europe. . . . **N3HBX**. I had a blast. Lots to learn. I have to start thinking west more. . . . **N3HXQ**. Very surprised to still work JA's on 10 m. Lots of fun—crazy! . . . **N3KCJ**. Fantastic conditions. Highest score ever. Everyone works everyone *wonderful*!. . . . **N6OU**. Best part of the contest was working WL7E on six bands with low power. . . . **N7DF**. This is the contest I enjoy the most. Too bad I did not have more time. . . . **N9KO**. Brad, NG2X, came out of a 10-year contest retirement for our WPX M/S operation. We had a great time!. . . . **NA2X**. Interesting contest. Decided to start out on 15 instead of 20 like usual. Maybe not so good, but Friday night was icky. Got better on Saturday and Saturday night was phenomenal. Great runs on Sunday afternoon, too. Hit some high rates. As usual this was and is my *favorite* contest. This one is just the best. Loved seeing all the other "9's" do well in T/S and other categories. See you all next year! . . . **NA9D**. Thought I'd try another category this year. Single Op Distracted is a good name for it. Found myself chasing packet spots instead of CQing more than once. Overall a good time. Contest could use more low band activity; apparently, doubling the points for low band contacts isn't enough of an incentive for enough stations to go there. . . . **NB1B**. Conditions terrible the first night. Luckily they picked up later in the weekend. . . . **NEØP**. Strange propagation. Some areas of the world were super strong; other parts just weren't there at all. . . . **NI9C**. I used the K1TTT super station located in western MA. . . . **NJ1F**. Tough going with only wire antennas. . . . **NM5O**.

What an adventure this contest was! Couldn't fall asleep Thursday night. Get up at 2 AM and take off for Cape Hatteras, NC beach adventure. Have car problems, get there late, barely set up antennas. Rig problems, amplifier relay quits, two radio switching doesn't work (labels faded, forgot how wired), contest starts, and I am trying to figure out this mess. Wire it all for straight 1 radio, 1 foot switch, two antennas, single band 10 m. Make few QSOs Friday night. After band dies, still trying to figure out two radio switching. No luck. Three AM finally dead tired I hit the bed. Set the alarm for 5:30 AM, next to my ear. Usually I don't need an alarm and wake up 5 min. before alarm goes off. Not this time. Wake up, bright day, 8:30 AM, band is in full swing, and I am like a moth next to the lamp. Oh well, do our best. Limping on, one radio, low power. Maybe more time to test the antennas. For the first time trying 4-square and 3-el dual-polarized quad on the beach. Quad seems to have advantage most of the time, but there are few cases when three calls on the quad will not get attention; one call on 4-square gets immediate response. Hmmm! Ugly weather, strong winds, horizontal rain, antennas dancing in the wind, quad shifts on the mast, need to check the headings from the window. Hope for LP U.S. record? Not a chance when closing bell rings. Disassemble antennas in the wind. Get ready to leave in the morning. Wake up to beautiful, calm sunny day, so at least drive home will be more pleasant. Few mobile QSOs on 10 m to check the effect of salt water. Sure enough, works like an amp. Get away from it, signals drop. What magic. Past Richmond, VA I figure time to reward myself with a fine cigar. Stop the car to check on fluids, try to light the cigar, no lighter. Just remembered I have pencil soldering torch gun. Get it from the trunk, light up cigar, put the torch on cassette tray, fasten belt ready to leave, only to notice black smoke (from cigar?). Look down and see my cassette tray on fire. Quickly throw it out, sprinkle club soda on rest of fire, extinguish burning cables under the dashboard with my fingers. Looks like no more flames. Ouch! Bye, bye cigar. Lucky fire didn't spread under the dashboard. I have seen cars burning on the highway—not a pretty sight. Rest of the trip is uneventful :-). That torch had some defect. It would not always shut off immediately; kept going for few seconds and that's what caused the fire. Happy with results of antenna tests. 4-square performs much better than triangular parasitic array; 3-el quad performs much better than parasitic vertical arrays I have tried in the fall. Good base for low band antennas; good cells for higher performance high band arrays. Back to the drawing board. Thanks to all for points! I wish people would check their own signals. Make sure you are readable and power meter doesn't show more power when not talking than when talking. That means too much audio gain/compression, ugly signal, hard to understand, and unnecessary QRM on the bands. . . . .**NT1E**.

Went into the contest with a sinus infection that was affecting my voice. Had to quit on Saturday morning when my voice quit. Later that night I was very sick with a fever. First time to ever quit in a contest and I did not like it. . . . **NV4X**. Strange conditions—better to JA than EU which is unusual from here! . . . **NY4A**. Good fun with the new class. A little unorganized to start (Murphy who?) but we had plenty of operating. Too bad the low bands weren't a little quieter. Finished with a 4-stack of fixed Yagis on 15. If there was a rotor it broke on every tower it seemed. . . . **NZ1U**. Very discouraging to fall well behind our 2000 score the first night. Condx kept improving as the contest went on; rates were better on Sunday. . . . **NZ8O**. OA4O is the official callsign of the Radio Club Peruano. . . . **OA4O**. First time to be back in WPX Contest after about 15 years of absence. This prefix is for celebration of 75 years of the Austrian Amateur Radio Association. . . . **OE75CWL**. Better try in CW (I hope). . . . .**OH1EB**. Saturday was a low propagation day but Sunday saved a lot of fun. . . . **OH3OJ**. Really poor conditions especially during the first day. I could not get good U.S. run—tactical mistakes because of wrong time in computer. . . . .**OI5AX**. I had fun as always in this contest. The allowed 36 hrs. makes it much more convenient and less stressing compared to the full 48 hours CQ WW. Ten meters on Sunday was marginal here when I heard KC1XX was about 55–56 on my stack and coming not from USA or even Caribean but PY!! I moved fast back to 15 m! . . . **OK1RI**. The worst propagation I ever experienced: UPØL with splatters over 15 kHz wide, W5WMU very similar. Both didn't respond. Thanks to Jiri, OK2RZ, for make possible to participate! Rig IC756 + Henry 3K (= 1x 3CX1200D7) + 45 elements of 8 Yagis. . . . **OK2RZ**. Very good contest and perfect CQ operators. Many CQ stations for S&P traffic. I didn't get HC8A at 7 MHz through intentional heavy QRM from EU.

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T-2X, $619.95. *Extra heavy duty Tailtwister antenna rotator!* For large antennas up to 20 square feet wind load when mounted in-tower, or 10 square feet when mast mounted with optional support bracket. Triple 138 ball bearing race, strong electric locking steel wedge brake. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches. Accepts masts up to $2^{1}/_{16}$ inches diameter. Rotator size is $14^{1}/_{16}$Hx$9^{3}/_{16}$D in.

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Wind Load capacity (inside tower)	20 sq. ft.	15 sq. ft.	8.5 sq. ft.	3.0 sq. ft.
Wind Load (with mast adapter)	10 sq. ft.	7.5 sq. ft.	5.0 sq. ft.	1.5 sq. ft.
Turning Power (in pounds)	1000	800	600	350
Brake Power (in pounds)	9000	5000	800	450
Brake Construction	Electric wedge	Electric wedge	Disc brake	Disc brake
Bearing Assembly/How many	Tripl race/138	Dual Race/96	Dual race/48	Dual race/12
Mounting Hardware	Clamp plate	Clamp plate	Clamp plate	Clamp plate
Control Cable Conductors	8	8	8	5
Shipping Weight (pounds)	28	24	22	14
Effective Moment (in tower)	3400 ft/lbs.	2800 ft/lbs.	1200 ft/lbs.	300 ft/lbs.

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WORLD	JY9NX ('01)	15,463,485
USA	NT1N ('01)	7,535,020
AFRICA	3V8BB('00)	15,266,880
ASIA	JY9NX ('01)	15,463,485
EUROPE	S5ØK ('00)	8,321,280
N. AMERICA	VA3UZ ('00)	9,026,416
OCEANIA	H44RY('98)	10,687,177
S. AMERICA	*P4ØA ('01)	12,547,872

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LOW POWER

WORLD	P4ØA ('01)	12,547,872
USA	WD5K ('00)	3,323,214
AFRICA	SU9ZZ ('01)	9,411,864
ASIA	UP5P ('00)	5,406,314
EUROPE	EA7GTF('99)	2,545,330
N. AMERICA	KP2/KF8UM('97)	4,772,124
OCEANIA	KHØ/JM1LRQ ('01)	6,685,416
S. AMERICA	P4ØA ('01)	12,547,872

CQ WW WPX SSB CONTEST
ALL-TIME LOW POWER RECORDS

WORLD

1.8 MHz	UN2O ('97)	196,308
3.7 MHz	CY7A ('98)	943,272
7 MHz	TA3J ('01)	2,617,428
14 MHz	IB4M ('95)	5,125,020
21 MHz	VC3M ('00)	5,365,405
28 MHz	J64AS ('00)	9,449,193
AB	ZD88V ('93)	14,501,145

USA

1.8 MHz	WIØWA ('00)	39,125
3.7 MHz	WA3RSK ('96)	355,752
7 MHz	W6KY ('97)	252,436
14 MHz	WE1USA ('01)	2,422,176
21 MHz	K4SN ('98)	868,560
28 MHz	NT1E ('01)	2,695,974
AB	AA3E ('00)	5,028,426

CONTINENTAL RECORDS

AFRICA

1.8 MHz	No Entrant	
3.7 MHz	No Entrant	
7 MHz	No Entrant	
14 MHz	9E1C ('00)	1,785,525
21 MHz	EA9UK ('93)	3,696,440
28 MHz	5N3MT ('93)	1,347,780
AB	ZD88V ('93)	14,501,145

ASIA

1.8 MHz	UN2O ('97)	196,308
3.7 MHz	4X1IM('99)	528,002
7 MHz	TA3J ('01)	2,617,428
14 MHz	RSØF('99)	3,025,609
21 MHz	4Z8DX ('00)	3,492,918
28 MHz	JG1EGG ('92)	3,276,396
AB	UP5P ('01)	5,406,314

EUROPE

1.8 MHz	T94ON ('96)	172,032
3.7 MHz	YP2A('99)	866,123
7 MHz	PA3AAV ('95)	1,130,256
14 MHz	IB4M ('95)	5,125,020
21 MHz	RU4PL ('00)	4,223,076
28 MHz	UA4LCQ ('00)	3,904,312
AB	GW7X ('01)	6,225,688

NORTH AMERICA

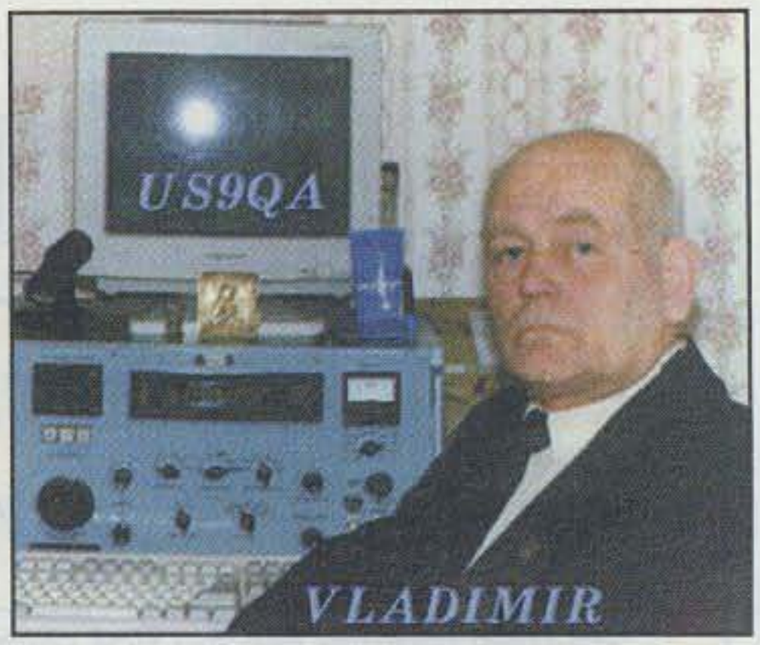
1.8 MHz	VY2MGY/3('99)	71,820
3.7 MHz	CY7A ('98)	943,272
7 MHz	XE2DV ('96)	2,414,320
14 MHz	WE1USA ('01)	2,422,176
21 MHz	VC3M ('00)	5,365,405
28 MHz	J64AS ('00)	9,449,193
AB	8P2K ('00)	9,473,783

OCEANIA

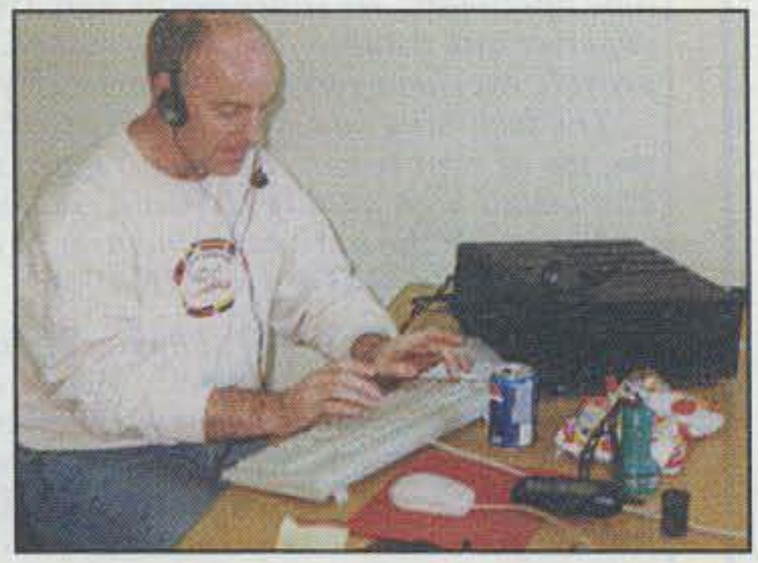
1.8 MHz	No Entrant	
3.7 MHz	No Entrant	
7 MHz	FK8GM ('98)	634,800
14 MHz	9M6AAC ('98)	1,846,256
21 MHz	4F4IX ('98)	2,840,255
28 MHz	YB2ARQ ('92)	2,155,766
AB	KHØ/JM1LRQ ('01)	6,685,416

SOUTH AMERICA

1.8 MHz	No Entrant	
3.7 MHz	YV4DSB ('95)	286,344
7 MHz	HJ6WQH ('95)	762,884
14 MHz	LS9F ('97)	2,153,859
21 MHz	P43DJ ('98)	4,236,138
28 MHz	PP5JD ('01)	7,599,774
AB	P4ØA ('01)	12,547,872



Vlad, US9QA, who operated QRP.



ZC4BS turned in the top low power score in Asia.

. . . **OK2SWD**. First day it was quite good, but on Sunday conditions were terrible in this location. But I think that it was maximum what I could do with my equipment. . . . **OM2DX**. Could only operate during limited period of time so I handed out points to the guys who replied to my QSL cards and worked some new prefixes. . . . **ON4CAS**. Gud propagation but not many pile-ups. Some problems with the antenna tuner. . . . **OT1P**.

Very poor conditions. Low bands almost dead (only 250 QSOs the first 4 hours!). Ten meters never opened up on Saturday but fortunately 15 was good! On Sunday 10 meters was okay to the States. . . . . **OT1T**. I arrived in Aruba a week before the contest and set up my suitcase station. This was not easy as it was very windy. My location was four houses away from P49MR's beach house. We both experienced overload problems on 15 m. I enjoyed my first experience operating WPX as DX. . . . **P4ØA**. The best conditions in all time—no QRM, good propagation, the best in my ham radio life. . . . **PP5JD**. WPX fantastic contest. Cheerio, USA, cheerio. . . . **RA9UAD**. My computer was collapsing during contest quite often and I believe there is a time problem with QSOs in some part of the log. (I found out that a few hours b4 the end that the time was wrong! For one hour!). . . . **S51TA**. Operated 19 hours then must stop! Got sick. Very sorry. Maybe next time better health. . . . **S54W**. It takes the mathematician to make such a "standard format"! . . . **S56A**. Just started on 15 m. Rig QRT. Me too. . . . **S57IIO**. First time 35 hrs. on air—ufff. Missed some easy mults and some USA on 80 m. . . . **S57MSU**. Conds were okay but not good. Didn't have much time to operate. . . . **SM3D**. The conds were okay but not much more. I had a lot of JA's calling in but NA was very poor. . . . **SM3W**. Poor condx. Not too many participants from U.S. as always. I run just for fun. . . . **SV/OK1YM**. Pleased with the results even though we needed more operators at. . . . **TF3IRA**. I missed a great propagation weekend by a couple of days. Thrill of the contest for me was being called by 4S7BRG both of us using low power. 10 m can be awesome. . . . **TI7/N4MO**. Better than the previous year. Some problem with the serial number between computers. Lot of fun. . . . **TO5T**. A great pleasure to work about 5000 QSOs and 13M points with a vertical antenna from Guadeloupe! . . . **TO9T**. Had very limted time but still had fun. . . . **VA6RA**. Great contest. This was a personal best for any contest any time. Now to move the sights even higher. . . . **VE1JS**. With young kids playing around in the shack I wasn't really contesting. But I had a great time making a few QSOs. Someone should add a bonus based on how many hours spent with their kids during a contest! hi. . . . **VE2OWL**. I had a lot of fun. I hope to participate next year. . . . **VE3ANX**.

Another good session for training contest operators. Always new things to learn every time a contest is entered. Special thanks to all who took the time to stop by and gave us a new multiplier and a contact. . . . **VE3MIS**. This was my first ever major contest and I enjoyed it immensely. I learned a lot and hope to do better next time. . . . **VE5MC**. Murphy struck immediately. DXTelnet 2 meter link failed after working nicely the day before. One station started with log on 20 and rig on 15 so the serial numbers on 20 start at 10, but we finally got going and the rest of the contest was pure fun. . . . **VE5RI**. We were actually ready when the contest started. All the network problems had been figured out. The amplifier that had the flash over on the Tune capacitor was pulled out of service. All the rotators were working. . . . **VE6FI**. This was my second contest. I had a great time! . . . **VE7AVV**. Log for checking purposes. Just wanted to work some other prefixes and give contact. . . . **VE7FCO**. My first serious attempt at single op contesting. Had a whole lot of fun. . . . **VE7NNN**. Had forgotten how much fun a contest can be. Looking forward to many more. . . . **VE7VR**. Got a late start but had a ball. . . . **VE9WH**. A very slow start: no contacts in the first few hours. Jammed rotator made the second day less competitive but still The Best Contest! I wish some would just *listen* in my direction—YW4A, 3V8BB, and others. . . . **VK1JDX**. The rudeness level of some ops seems to be rising each year. Maybe some emphasis on operating courtesy should be encouraged. You would think that money was riding on each QSO with some stations—i.e., contact at all costs regardless of common courtesy. . . . **VK2CA**. It seems that everything was against those of us in VK this year. I lent my shack to a friend for the contest and band conditions were so poor that after 32 hours he gave up. I then decided to give it a go and after 6.5 hours I had only 411 contacts, S&P. . . . **VK4CEJ**. My choice of single band 10 m turned out to be a disappointment as it opened late and closed early. I spent many hours listening to white noise with no workable signals. . . . **VK4EJ**. Conditions went from terrible through lousy to barely acceptable! I am one or two skips too far. The old 30 hour format would have made me at least able to be competitive. . . . **VK5GN**. Great to be on the air again. 100 W into a vertical does well. . . . **VK6JIP**.

Used N1MM logging program for first time. . . . **W1TO**. My first CQ WPX Contest! Great fun; looking forward to doing better next year. . . . **W2RDS**. Low power was great. Really enjoyed the JA's blasting in Saturday night! See ya next year. . . . **W4AMP**. Operated at my Dad's stn, lots of fun, first time 20 m. . . . **W4SVO**. Sorry to report my computer had problem with counting *sequence* numbers. Have missing and double numbers. Gave up trying to correct so gave out # computer said! Please don't penalize others for my problem! . . . **W6CN**. Part-time operation between weekend chores = still making up for a Jamaica trip. . . . **W6NS**. Rolling blackouts are a real risk out here in W6 land but I never got hit. . . . **W6QU**. Reached all the goals I set for this contest. Next year I'm going to really have to work hard to beat my best score ever. 40 and 80 left a lot to be desired this weekend. High bands were great! . . . **W6SA**. Had just awful QRN and conditions thanks to the sun and the snow squalls. We were killed by latitude! . . . . **W6XR**. Real weird propagation on 24 March beginning at 0624Z on 20. I worked KX8R, S53EO, EM1KCC with the tribander pointing southeast when I could not hear them on the monobander aimed at Europe. . . . **W8AEF**. Only 6-1/2 hours operating time but had lots of fun. . . . **W9LYA**. The band seemed better on Sunday. . . . **WA2YJF**. First

HF contest!. . . . **WA2ZOU**. It would have been a multi-band entry but the old tube rig fritzed at the last minute. Also, my Rottweiler ate the coax to my multi-band antenna the day before the contest. . . . **WA4JA**. Casually operated to get a bunch of new countries for me! I'll have to do this one seriously next year. I can see top ops getting DXCC in one contest. Nice turnout, good band conditions. . . . **WA6DLM**. Rotten conditions. A QRPer's nightmare! . . . **WB7OCV**. My new reading glasses (prescribed by myself) sure helped me see my computer screen better this year. Isn't it fun getting older? . . . **WB8TLI**. First time this station has been in a contest since mid '80s. Tnx all the Q's and look for us in CW. . . . **WD5GSL**. First WPX high power, although I ran barefoot most of time. Next year I will use packet for spotting! . . . **WF2B**.

Conditions on 160 were not good. High noise levels combined with at times with what sounded similar to picket fencing on 2 meters (aurora?) made it difficult. The morning after the contest I wound up in the hospital due to an elevated white blood cell count. Maybe contesting is hazardous to your health. . . .**WIØWA**. First time using Writelog program. I think I was distracted a bit so the score is down from last year. . . . **WN6K**. Amp died Saturday nite. Got it back except for 10 meters. Made Sunday a bit more challenging. Thanks, Ric! . . . **WO4O**. The WPX contest brings out the best in us. In 36 hours I heard no arguing, jamming, or cussing! The WPX is more than a contest; it's a polite competition between friends both old and new. . . . **WS1A**. Propagation was not as strong as in the 2000 WPX contest. I fell behind early and never recovered. . . . **WS7V**. It was fun to do. . . . **WV2LI**. Only had a few hours to spare on Sunday. What a fun day! . . . **WX6V**. Excellent propagation toward Europe in 10 meters. Pity. My radio was damaged and the power was of 20 watts but with distortion. . . . **XE1BEF**. Thanks to all operators and *CQ* magazine for such a good time. Was very much fun and very nice contest operators. . . . **XE2AUB**. Most exciting WPX to date from this fantastic location. . . . **ZD8K**. TS-570DG with 100 W was used for all contacts; 3-el tribander was used for 10-15-20 m contacts; dipole was used for 40 m. I am licensed since September 1999. Ron, H4ØRW (ZL1AMO), kindly gave me points and mult at the end of the contest. I think I was his only contact. . . . **ZL1TM**. Thanks to the contest organizers and sponsors. . . . **ZL3GA**. XYL has Alzheimers so not much time to be active. . . . **ZSØE**.

Station Operators
Multi-Op, Single Transmitter

4LØG: 4L2M, 4L1DA, 4L4CR, 4L7O. **4N7M**: 4N7RGH, YZ7EM YU7RW. **9A7A**: 9A5K, 9A7V, 9A8A, 9A3OS, 9A3TR, 9A4BT, 9A4PA, 9A4RX, 9A6DM. **9A8M**: Ops. **ABØMV**: ABØMV, NØHF, AEØQ. **ABØS**: ABØS, WØNO, KØWA. **AB2DE**: N2KPB, N2ZR, KC2AVE. **AE9B**: AE9B, KGØUS,

CQ WW WPX SSB CONTEST
ALL-TIME RECORDS

The contest is held each year on the last full weekend of March. The All-Time Records will be updated and published annually. Data following the calls: year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS
Single Operator

1.8	VA1A('99)	535,225	271
3.5	EA8/OH1MA('97)	4,317,284	562
7.0	ZX9A('97)	10,787,128	814
14	EA8AH('97)	11,142,198	981
21	ZW5B('95)	14,095,142	1054
28	EA8AH('00)	14,567,148	1116
AB	HC8A('01)	25,180,199	1199
QRP/p	HC8A('94)	7,520,562	714

Multi-Operator Single Xmtr.

HC8A('93)	32,502,677	1107

Multi-Operator Multi Xmtr.

CN8WW('99)	55,151,562	1334

U.S.A. RECORD HOLDERS
Single Operator

1.8	K1ZM('95)	327,712	308
3.5	WE3C('95)	1,519,300	475
7.0	KC7EM('95)	1,950,228	495
14	KK9A('00)	6,621,446	962
21	KX8R('00)	7,556,250	930
28	NY4A('00)	6,006,573	877
AB	KQ2M('00)	11,875,240	1066
QRPp	KR2Q('00)	2,688,158	649

Multi-Operator Single Transmitter

KM3T('99)	14,091,468	1077

Multi-Operator Multi- Transmitter

KM3T('00)	29,338,460	1355

CLUB RECORD

Contest Club Finland ('00)	250,320,141

QRPp RECORD

HC8A('94)	7,520,562	

WPX (Prefix) RECORD

OTØA('00)	1528	

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	EA8/OH1MA('99)	404,976	208
3.5	EA8/OH1MA('97)	4,317,284	562
7.0	EA8AH('96)	7,101,380	715
14	EA8AH('97)	11,142,198	981
21	EA8AH('01)	12,387,139	1063
28	EA8AH('00)	14,567,148	1116
AB	CN2R('01)	20,530,495	1115

ASIA

1.8	UL7ACI('91)	331,008	128
3.5	UA9CSS('94)	1,074,780	315
7.0	H24LP('87)	5,348,975	503
14	H2A('91)	6,297,464	758
21	7L1GVE('92)	6,848,136	838
28	H22H('00)	9,092,146	931
AB	JY9NX('01)	15,463,485	1017

EUROPE

1.8	LY6K('95)	481,164	303
3.5	YT6A('96)	1,976,436	558
7.0	9A9A('99)	4,624,188	724
14	DJ7AA('00)	7,955,224	1052
21	CQ1BOP('00)	6,989,997	1029
28	GM7V('00)	8,305,756	982
AB	OK1RI('01)	10,844,592	1034

NORTH AMERICA

1.8	VA1A('99)	535,225	271
3.5	VE1BY('00)	2,226,300	492
7.0	TE1C('95)	7,281,630	745
14	KP2A('95)	7,088,976	912
21	WP3R('98)	10,167,632	986
28	KP2A('00)	11,385,710	1046
AB	TI1C('99)	17,078,930	1117

OCEANIA

1.8	AH6PR('99)	18,963	49
3.5	N6VI/KH6('94)	1,016,652	273
7.0	WH7Z('99)	4,582,773	507
14	KG6DX('90)	4,558,527	733
21	AH7DX('00)	7,645,990	890
28	TXØDX('00)	12,049,422	847
AB	KH6ND('01)	15,498,798	1029

SOUTH AMERICA

1.8	YV5JEA('84)	40,320	63
3.5	P4ØA('96)	1,715,076	426
7.0	ZX9A('97)	10,787,128	814
14	PYØFM('95)	9,660,432	939
21	ZW5B('95)	14,095,142	1054
28	ZX5J('99)	14,405,820	1095
AB	HC8A('01)	25,180,199	1199

MULTI-OPERATOR SINGLE TRANSMITTER

AF	CQ9K('01)	26,146,204	1292
AS	TA5/NØFYR('91)	16,474,965	1005
EU	TM5C('01)	17,220,474	1206
NA	VP2EC('92)	24,409,580	1115
OC	T33RD('99)	17,778,372	998
SA	HC8A('93)	32,502,677	1107

MULTI-OPERATOR MULTI-TRANSMITTER

AF	CN8WW('99)	55,151,562	1334
AS	P3A('00)	53,554,592	1456
EU	9AY2K('00)	42,477,343	1493
NA	WL7E('00)	42,013,215	1395
OC	FKØAW('89)	26,538,972	1002
SA	ZX5J('00)	46,550,452	1508

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3CX2500H3	4CX400A	4CX20000A7	4-125A
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KØOU, WØZAP, KCØDLM, KBØVVT, KCØDEA, KI7WO, NØEVH. **AI7B:** N2WEW, K7ZUM, KI7Y, W7WLL, W7GG. **AM4YK**: EA4YK, EA4TD, EA4ST, EC4AGR, EC4AHX. **AM7UR**: EA7UR, EA7ESH, EC7AJL. **AM8CI**: EA8ZS, EA8CI, EA8DP, EA8BYM , EA8BVX, EA8AZM, EA8NL, EC8ABT, EA8CAJ, EA8RA, EA8AKQ, EA8IR, EA8BYG, EA8FO, EC8ACH, EA9AYV. **AN1COZ**: EA1COZ, EA1EAG, EA1AS. **AN1RCM**: Club Group. **AN2WP**: EA2MQ, EA2AZ, EA2ATU, EA2CCG, EC2AHS, EC2AZY, Jesus, Ramon, Inaki. **CQ1CV**: CT1ETE, CT1GFK, CT1GPQ, CT2GTP. **CQ3A**: CT3CK, CT3EX, CT3FQ, CT3HV. **CQ9K**: CT3BD, CT3DL, CT3EE, CT3EN, CT3HK, CT3IA, CT3IQ, CT3KU, CT1BOP, CT1DIZ. **DLØGEO**: DL1EMH, DL2YAK, DL3QQ, DLØIV, DL7AHQ, DL7YT, DL7VX, DL7ANR, DJ9JD, DF5YS. **DL2ARD**: DL1WA, DL2AMC, DL2ARD. **DL3ABL**: DL3ABL, DL6MHW. **DL3KZA**: DL1KZA, DL3KZA, DL7UVO. **DL6RAI**: DJ5CL & DL6RAI. **DN1MA**: Robert, Markus, Michi. **EA1EEY**: EA1EEY, EA1CS, EA1CUB, EA1DZW, EA1BVP, EA1WX. **EA8KK**: EA8KK, EA8AG, EA8AFJ, EA8AFB. **ES1XQ**: ES1THQ, ES3THP. **ES2X**: ES2QH, ES2RJ, ES1LAA, ES2NA. **ES5Q**: ES5MC, ES5MG, ES5QX, ES5RN, ES5RW, ES5RY, ES5TV. **F6KFI**: F5OVQ, F8CGL. **F6KHK**: F5USK, F5LTT, F5REH. **FM5GU**: IV3FHH, IV3JVJ, IV3TDM, FM5GU, FM5WD. **G4UJS**: G4UJS, G3VAO, G4XUM, GØKTH. **GX4NOK**: 2E1FVS, GØSCV, G4ATA. **HBØ/F6KQL**: F2TA, F5LIW, F5IYJ, F6GAK, F5BNF. **HB4FG**: HB9DOS, HB9DHG, HB9FAQ, HB9SUL, HB9FBL, HB9ALM. **HG1S**: HA1AG, HA1TJ, HA1DAE, HA1DAC, HA1DAI. **HLØO**: Club Group. **I4GAS**: I4GAS & I4AUM. **II9F**: IT9FXY, IT9WKH, IT9HBT, IT9GNG, IT9ECQ, IW9FRA. **IO2L**: I2OKW, IK2PFL, IK2YXP, IW2HAJ, **IO4I**: IK4QIB, IZ4DPV. **IQ8D**: IZ8DEP, IZ8DBJ, IZ8DWR, IZ8DTS. **IQ9K**: IT9KWF, IT9EWG, IT9CYH. **IR2G**: IK2RXX, IK2DUV, IZ2DOB. **IR3P**: IV3EHH, IV3BVK, IV3BTY, IV3NTA, IV3WZG, IV3YDD, IV3/KB7OZT, IV3RYP. **IR4T**: I4UFH, IK4UPB, IK4MHB, IK2SGC, IK2NCJ. **IU2M**: I2WIJ, IK2SFZ, IK2SAI, IK2RPJ, IK2GWH, IK2PZC, IK2ZEY. **IV3NVN**: IV3NVN, PP5TO.

JA1YPA: JA1ATK, JA1PEJ, JH1FDP, JO1CRA, JK2RCP, JH6VLF. **JH1EAQ**: JE1CKA, JA1WSX, JH1GTV, JR1AIB, JH1EAQ. **JI2ZEY**: JA2BY, JA2BIV, JA2BIL, JM2CCL, JQ2BBC. **JI2ZJS**: JA2AXB, JA2JDR, JA2JSF, JH2UVL, JE2HCJ, JG2TSL, JL2TAW, JM2RUV. **JW8G**: LA9IY & LA9GY. **KØDU**: KØDU, KCØDKX, NØZA. **KØRAY**: AAØA, NØPKX. **KD9ST**: KD9ST, KA9SQS, KA9SQR, KB9EXE. **KF4ASU**: KF4ASU, KW4JS, Squad. **KF8UN**: KF8UN, KIØDE, KC8LYG. **KG5U**: GMØECO, KG5U, K5WA, W5ASP. **KJ9D**: N9LF & W9TN. **KM8I**: KM8I, KB8QO, AB8FY, K8DVX, WD8RIK, K8CQF, KB8PNR. **KS3F**: KS3F, NE3F, KB3FSE. **KTØR**: KØAD, KØOB, NØKK, NØUR, KØMX, KTØR. **KY4AA**: K4AT, K4IU, K4WW, K9GX, KC4CQT, N4GN, W4OKY. **LR7DX**: LU3FP, LU5FA, LU2FFD. **LU1NF**: LU1NDC, LU1NAF, LU8NA, LU4NAZ, LU2NAA, LU7NN, LU4NAS. **LU5FB**: LU1FGE, LU6FQD, LU1FD, LU3FQG, LU3FZW, LU1FKR. **LU6DK**: **LU7FJ**: LU5FF, LU5FII, LU4FXI, LU7FNI. **LV5V**: LU1VV, LU5VC, LU5VV. **LX5A**: LX1AQ, LX1RQ, DL5KUT, DK2OY. **LY1ØXA**: LY2GW, LY4AB. **LY2IN**: LY2OM, LY2BUU, ex-LY3BGT. **LY8X**: LY2BIL, LY2BKF. **M2H**: Ops. **M4U**: GØDVJ, MØCGE, G4AQZ, G4YJQ, M1DSY, G7HOW, G4FTP. **M5W**: GØMTN, MØCOP, M5UGC, G3YCH, GØUWS, GØEYO. **NØLM**: KVØL, KCØFXI, WØHXB, WØETT, KCØERX, KCØGBC. **NØNI**: NØHR, NØNI, NØAC, KØKD. **N1XL**: N1XL & K2GH. **N7WDX**: N7WDX & N6HR. **NA2X**: NG2X & NA2X. **NF4A**: N4PN, N4OX, NF4A. **NT6K**: NT6K & KA6BIM. **NU4Y**: NU4Y, W4FDA, KC4FWS, KC4OO, W3KT, WA4B. **NZ1U**: KB1H, KB1DFB, N1XS. **OA4O**: OA4AHW, OA4BHY, OA4DJW, OA4KDC. **OH1F**: OH1NOA, OH1MDR, OH1MM, OH1EH, OH1HEV. **OH2KU**: OH2KU, OH1WZ. **OK1MJA**: Ops. **OK5SWL**: OK2SWD. **OL1C**: OK1AN, OK1IEC, OK1IPS, OK8AAM, OK1DPU, OK1FPQ, OK1DUG. **OL5KRT**: OK2XA, OK2CVA, OK2BUZ, OK2BJS, OK2VMC. **OL5Q**: OK1FFU, OK1FLC, OK1VSL, OK1HRA. **OM3KWZ**: OM7RC, OM7AA, OM7CW, OM7AR. **OM7M**: OM3PA, OM3PC, OM5RM, OM5RW, OM5ZW. **ON6BR**: ON4CGZ, ON4CHL, ON5RA, ON4CBI, ON4CBM, ON4AYL, ON4CFV, ON2BGP, ON4AGY, ON1DO, ON1DRR, ON4AUP. **OR5EU**: DF3TJ & ON5GA. **OT1C**: ON4ACA, ON4AJZ, ON4ALT, ON4AMI, ON4ASW, ON4BCB, ON4CEQ, ON4CJN, ON6MR, ON7UN, DIRK, Eddy. **OT1P**: ON4LCW, ON5AV, ON5OO, ON6AH, ON6MH, ON6QR, ON6VL, ON7PC. **OZØJ**: OZ1JTE & OZØJ. **OZØP**: OZ1AA, OZ1AXG, OZ1CJX. **OZ5ESB**: OZ1CWP, OZ1DPR, OZ1HXQ, OZ1INN. **OZ7HAM**: OZ1MAT & OZ1ETA.

P39P: Vassilia, Christakis, Demetris, Antonis, Christos, Fernando. **PY2GEC**: PY2GA, PY2TO, PR8RZJ. **PY2LDS**: Club Group. **PY2ZR**: PY2ZR, PU2NYV. **RF9C**: RZ9CO, RA9CKQ, UA9CIR, UA9CDC, UA9CDT. **RI4M**: RA4LW, RN4LP, RU4LM. **RK4HWZ**: RV4HL & UA4HA. **RK6LZS**: RV6LA, RA6LIS, RX6LEM. **RK6XWA**: UA6XDX, UA6XHT, RA6XR, RA6XLM, RA6XMF. **RK9MXS**: Sokolov, Shumilin, Popov. **RT9W**: RU9WX, RX9WR, RX9WI, RW9WY, RW9WW, UA9WDR, UA9-Ø84-489, UA9-Ø84-442, RA9WR. **RWØA**: RVØAR, RVØAX, RAØALM. **RW3WWW**: RW3WW, RA3WJ, RA3WPM, RA3WPN, RA3WSJ, RW3WX. **RZ3DZF**: Club Group. **RZ3DZJ**: Andy K., Andy S., Art. **S52SLO**: S57PW, S57RZA, S57RWA. **SI9ØØTKM**: SM6HRR, SM6DKS, SM6VVT, SM6NM, SM6CUM. **SK5MR**: SM5CNQ, SM5WYH, SM5WJB. **SK6D**: SM6XEI, SM6VUL, SM6FUD. **SN2B**: SP2FAX, SP2WKB, SP8RX. **SN6U**: SP6NVK & SP6OPE. **SP1PEA**: Ops. **SP9KDA**: SP6MQO & SP6-8522. **SP9KDU**: SP9AVZ & SQ9FMU. **SP9KRT**: SP9ADU, SP9ZW, SQ9FVR. **TA2KD**: TA7W & TA2NC. **TF3IRA**: TF3AO, TF3HP, TF3VS, TF3RJT. **TMØS**: F5NBU, F5ODF, F5ARU, F5CVI. **TM2V**: F6GLH, F6GYT, F1Ø881. **TM2Y**: F5MZN, F6BEE, F8CRH, F5HRY, F6FVY, F5OIH. **TM5C**: F6CTT, F5VCO, F1UVN. **TM5K**: F5BMP & F5BGR. **TM7Z**: F5CWU, F5MOO, F5NFG, F1PYB, Sylvain. **TO5T**: FM5BH, FM5FJ, FM5DS. **TO9T**: F6HMQ/FG & F6GWV/FG.

UPØL: UN9LW & UN7LAN. **UR2E**: UR5EAW, USE-Ø73, UR7EU, UR7EO, UR6ET. **UR4PWC**: US-P-291, US-P-296, US-P-361, US-P-362, US-P-363. **US8U**: UY2UF, UT5UPN, UT5UBJ. **UX8IXX**: UX8IX, US8ICA, US8IDV, US-I-620, US-I-621. **VA3MG**: VA3MG, VE3XL, VA3KA. **VE2CMH**: VA2MP, VA2TG, VE2TPE, VE2FAL, VE2LOA, VA2TO. **VE3MIS**: VE3XAP, VA3UA, VE3IMG, VE3SQG. **VE3RM**: VE3RM, VE3WRL, VE3WIB. **VE5TP**: VE5TP, VE5DX, VE5CPU, VE5SF, VE5RG. **VP5V**: K5CM, N5KW, W5AO. **WØMA**: KØBX, WØGOM, NØAJ. **W1SMH**: W1TW, KA1EZH, KA1EWN, K1JWP. **W3IQ**: N3SD & W3IQ. **W3IZ**: W3IZ & N3ONM. **W3LJ**: W3LJ, W3IDT, KA3UBJ, K8DH. **W6XR**: W6XR, N2AU, N2VR, W2AD. **W7VJ**: W7VJ & W7RG. **WD5GSL**: N5KB, KK7JS, Larry. **WFØRT**: KA9FAJ, WBØB, ABØKP, KBØDKE, KBØSMG. **WO8CC**: N8NR, N8BJQ, N9AG. **WV2LI**: N2GA, K2DO, KS2G, N2KPY, K2ES, K2EPM. **WX7P**: WX7P & KL7DU. **WZ6E**: N6DE, WZ6E, W6KNS, W6LD, N7MH. **YL7C**: YL2MD, YL2GQT, YL2RQ. **YT1Z**: YT1WN, YU1YM, YU1PD, YT1EFP, Sanja, Stepa, Uros. **YU1AVQ**: YU1QL, YZ1JA, 4N1GS. **YU1INO**: L.J. Radosavljevic, S. Radosavljevic, S. Mladenovic, D. Dzurdzic, B. Golubovic, YU1EK. **YU7KWX**: YU7SK, YU7EE, YU7CA, YZ7MFJ. **ZD8K**: GW4BVJ, G3TTC, GØWMW. **ZV3F**: PY3PA, PY3TIO, PY3MT. **ZW3F**: PY3DJB & PY3ASM. **ZXØF**: PY5CC, PYØFF, N5FA, PY7ZZ. **ZY2AA**: PY2NY, PY2APQ, PY2ELG, PY2TI, PY2VYT, PY2DJ.

CONTINENTAL LEADERS

AFRICA

1.8	No Entry	
3.5	No Entry	
7	EA9LZ	6,714,062
14	*CT3KN	569,976
21	EA8AH	12,387,139
28	*J28LP	1,092,960
AB	CN2R	20,530,495

ASIA

1.8	No Entry	
3.5	EK6CC	703,290
7	*TA3J	2,617,428
14	UA9MA	4,501,518
21	JI3OPA	4,516,864
28	5B4KH	5,400,687
AB	JY9NX	15,463,485

EUROPE

1.8	9A6A	453,924
3.5	S59CAB	1,064,700
7	UA2FB	2,227,795
14	4O1B	4,702,538
21	9A3GW	5,177,168
28	9HØA	8,166,158
AB	OK1RI	10,844,592

NORTH AMERICA

1.8	AA4MM	58,032
3.5	AA1BU	638,577
7	WK4R	1,097,848
14	VYØAA	5,238,948
21	VB6A	7,925,940
28	KP3A	4,473,568
AB	KQ2M	9,668,020

OCEANIA

1.8	No Entry	
3.5	AH6OZ	411,450
7	No Entry	
14	VK1JDX	72,352
21	9M6A	5,052,699
28	*4F4IX	1,153,690
AB	KH6ND	15,498,798

SOUTH AMERICA

1.8	No Entry	
3.5	No Entry	
7	L2ØF	437,248
14	FY5FY	5,518,910
21	P49MR	3,491,560
28	LP1F	7,785,953
AB	HC8A	25,180,199

MULTI-OPERATOR SINGLE TRANSMITTER

AF	CQ9K	26,146,204
AS	RF9C	14,207,193
EU	TM5C	17,220,474
NA	FM5GU	19,260,780
OC	No Entry	
SA	ZXØF	31,700,536

MULTI-OPERATOR MULTI-TRANSMITTER

AF	No Entry	
AS	A61AJ	51,659,150
EU	OT1A	31,830,425
NA	WL7E	35,617,140
OC	TX8G	19,842,004
SA	ZX5J	46,185,516

**Low Power*

Multi-Op, Multi-Transmitter

A61AJ: A61AJ, K3EST, WØUN, N2AA, T97C, W3ZZ, UA9BA, N5KO, VE3EJ, N4QB, K2RED, S5ØA, S53R, S56MM. **AK3Z**: AK3Z, N3SB, WX3B, W3ARS, W3JJH, NY3A, N3YIM. **ED4URE**: EA1DVY, EA1EY, EA1JE, EA4AAA, EA4ABE, EA4BPJ, EA4BT, EA4ECF, EA4GW, EA5RM, EA7HCU, EA7JB, EC4ABH, UY7CW, EB4AKI, EB4EPJ. **ED7VG**: EA7HY, EA7ATX, EA7CCA, EA7EZQ, EA7DQL, EA7AY. **GM3GBZ**: GM4AFF, MM5BRI, GMØVIT, MMØBDA, GMØBTK, GMØTWB, MM1EQE, MMØBIX, GMØRRU, GM4ZRR. **HG6N**: HA2SX, HA2NA, HA6ND, HA6NY, HA6PX, HA7UW, HA8IB, HA9AX, HA9SU, HA9PP, YO5BRZ. **J41K**: SV1DPI, SV1CIB, SV1CQN, SV1DPP, SV1DHU, SV1UK, SV1ETK, SV1DPX, SV1CIE, SV1DPE, SV1ALF, SV1CQK. **KJ7BP**: KJ7BP, KD7E, N7UK, KD7KKR, KD7KUN, KC7GMF, KC7MDA. **KL7RA**: KL7RA, AL7AF, AL7IF, AL7MU, AL7RF, KL7AC, KL7TC, NL7Y, W5GN. **L4ØF**: LU1FAM, LU1FGZ, LU1FZR, LU2FP, LU2FT, LU3FCK, LU4FPZ, LU6FA, LU6FEC, LU8FCM, LU8FOX, LU8FPT. **LY7A**: LYR346, Remigijus, Einaras, LY3NUT, LY2HK, LY2OC, LY1FDT, LY3DA, LY3HD, LY2KJ, LY3TT, LY1FU, LY2UF, LY2BUE, LY2LL, LY1EE, Vitalijus, LY4AA, LY2BMX, LY2KZ, LY2NK. **NR6O**: K6AW, K6CTA, K6IF, N6BV, N6RO, W1SRD, WX5S, WA6O, WJ6O (G3WGN). **NZ8O**: K8CC, K8GT, KE8OC, KT8X, KU8E, N8MG, N8NX, N8VW, W8MJ, W8UA, WD8S.

OH6K: OH6XX, OH6UV, OH6MSZ, ex-OH6NU. **OL5T**: OK1TC, OK1WWJ, OK1PAT, OK1TNM, OK1BJP, XQ2PPA. **OL7R**: OK1XUV, OK1VWK, OK1MZM, OK1ZMS, OK1WMV. **OT1A**: DF3KV, DH5HV, DJ7EO, ON1AFN, ON1AWB, ON1CIM, ON1DLJ, ON1DMO, ON1DQZ. **P3A**: RA9JX, RZ9UA, UA9YAB, RAØAM, RVØAU, RZ3TX, RW3TN, RW9UP, UA9UHD, 5B4ADA, 5B4LP, RZ9OA, UA9OTM. **PI4COM**: PA1ZX, PA3CAL, PA3EWP, PA3FQA, PA5AT, PA5ET, PA7FM. **PY3MHZ**: PY3ABT, PY3AFS, PY3BM, PY3BUZ, PY3BZA, PY3CEJ, PY3CQ, PY3CTA, PY3DX, PY3DZZ, PY3FOX, PY3HSP, PY3KK, PY3KN, PY3MM, PY3YY, PY3AN, PU3CAL. **RU1A**: Dmitry, UA1ANA, UN7LZ, RW1AC, RA1ACJ, RX1AA, UA1ARX, RN1AM, RV1AW. **S5ØS**: S5ØS, S58A, S57O, S53O, S52EZ, S57NW, S51RJ, OE2VEL, OE2GEN, DK6WL, DJ5IW, DL1MGB, S52ZW, S59G, S51ZX. **TX8G**: LA5IIA, FK8HC, FK8GM, John. **VE5RI**: VE5CJR, VE5FN, VE5RMO, VE5WI, VA6EA, VE6BBP, VE6DDD, VE6EZ. **VE6FI**: VE6FI, VE6AQ, VE6LB, VE6NA, VE6ZA, VE6LDX, VE6PY, VE6YOT, VE6VIS, VE6ADD, VE6ARA. **VE7SCC**: VA7DX, VE7HHS, VE7MRP, VE7BQM, VE7ZNU, VE7CGE, VE7JJD. **VR2KW**: VR2KW, VR2MY, VR2/VE7RDO, VR2YRC, VR2ZST. **W4MYA**: KF4QQY, N4DEN, N4EHJ, W4DR, W4HJ, W4HZ, W4MYA, WK4Y, WA4QDM, and of course Lilly. **WL7E**: WL7E, KL7Y, KL2A, KL7FH, WA2GO, AL7PJ, KL5E, KL7CC. **WM2H**: WM2H, N2NC, N2RM, N2VV, WK2G. **WR3L**: WR3L, K3FT, AA3SC, KA3TUL. **YW4M**: DL2GG, YV2IF, YV5AMH, YV5ANF, YV5EED, YV5FAA, YV5IQJ, YV5LMW, YV5LMX, YV5OBU. **YZ7W**: YT7DQ, YU7ZZ, YU7MO, YZ7RSD, YZ7RLY, YU7PT. **Z39A**: Z31GX, Z31JA, Z32AM, Z32XX, Z33A, Z33F, Z35A, AA4MN, EA4ATI, Z32RS. **ZX5J**: PP5JR, LU6ETB, LU1HF, K1ZM, PP5WG, PP5BRV, PP5UA, PP5MCB, PY5ZBU.

(Continued on page 106)

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DESKTOP SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅜ x 6 x 9	3.4
SS-18	15	18	1⅜ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅜	4.2
SS-30	25	30	3¾ x 7 x 9⅝	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9⅜	4.2
SS-30M*	25	30	3¾ x 7 x 9⅝	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅜	6.5
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅜	6.5
SRM-30M	25	30	3½ x 19 x 9⅝	7.0

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅜	10.5
SRM-30-2	25	30	3½ x 19 x 9⅝	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅜	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅝	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

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EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

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SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

*ICS – Intermittent Communication Service

On 160 meters darkness determines propagation, whether by the change from summer to winter or from dawn to dusk. This means the paths taken by 1.8 MHz signals are sometimes very different from what is conventionally thought.

Equinoctial and Diurnal Path Switching

A New Perspective on Long-Path and Short-Path DXing on the Topband—Part I

BY STEVE IRELAND, VK6VZ,* MIKE BAZLEY, VK6HD, AND BOB BROWN, NM7M

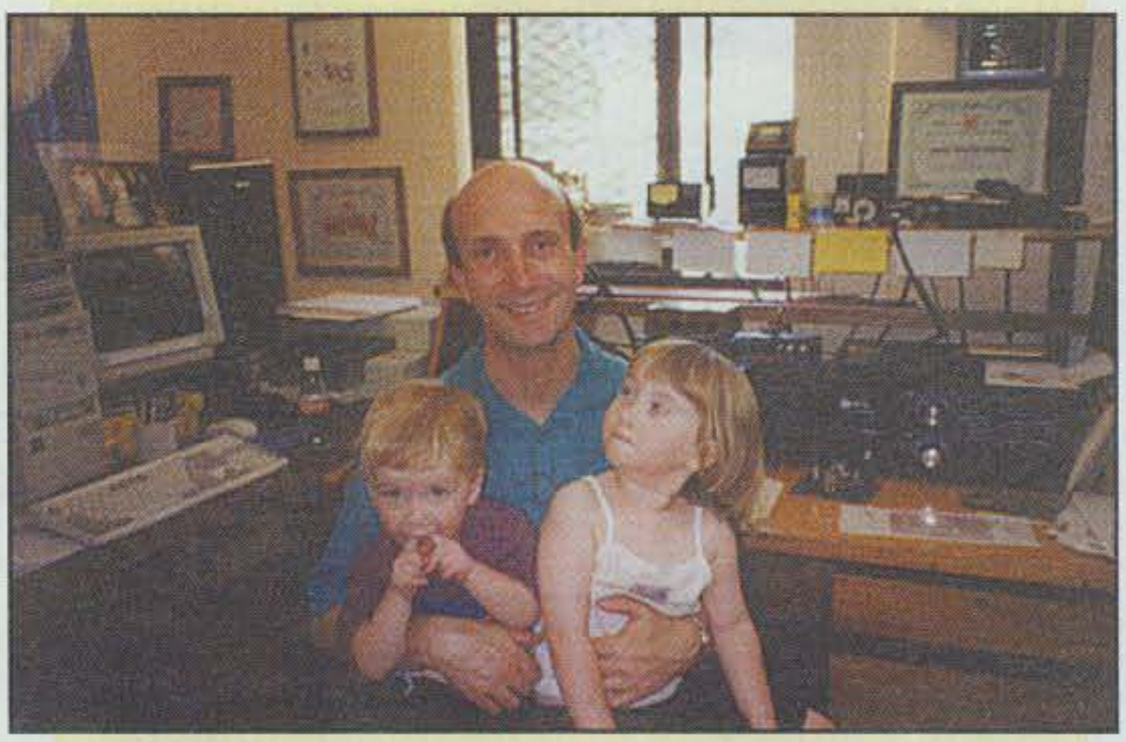
The conventional wisdom for those of us who are interested in long-distance DXing on the topband (1.8 MHz or 160 meters) has been that a particular DX path is either *long path* or *short path,* depending on what time of day it occurs—and regardless of the time of year. For those topband operators who live on the east coast of North America, for example, contacts made around their local sunset with Western Australia have always been termed *long-path,* as they have in VK6, whatever time of year they occur. This article will explain that we have been operating under a simplistic misconception and that the truth is far more interesting!

This "truth" does not apply only to the eastern North America to Western Australia path, but to all long-distance contacts on the 1.8 MHz band where one end of the path lies relatively close to the *antipodal* point of the other—i.e., at the opposite side of the world. Whether it is northeastern North America to Western Australia or western Europe to New Zealand, or whatever the path, the perspective applies.

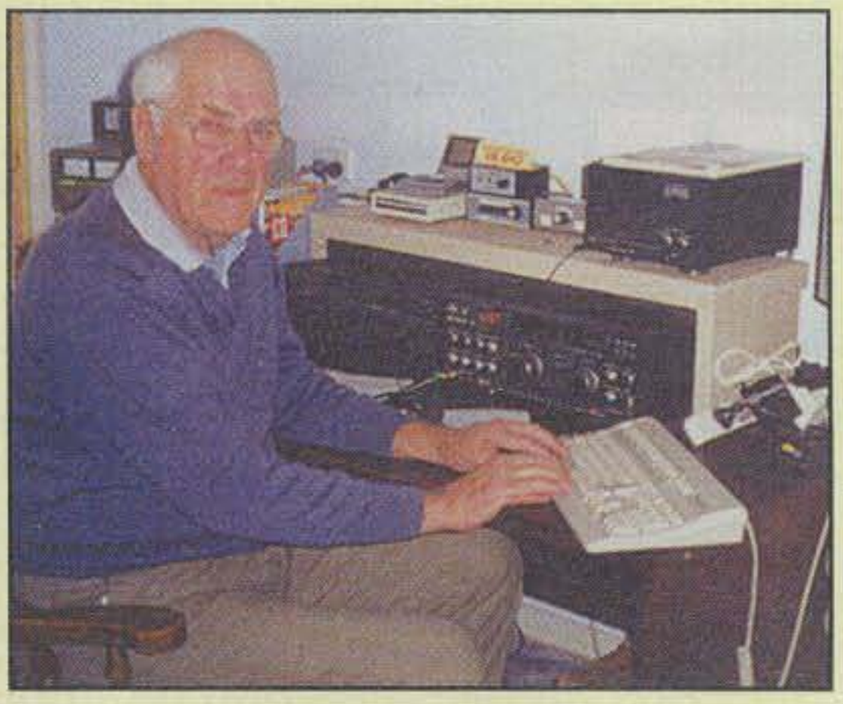
It is often said, particularly by its devotees, that 1.8 MHz is the last frontier when it comes to understanding radio propagation on the medium frequencies (300 kHz to 3.0 MHz). Those of us who spend a lot of time and energy exploring it for DX contacts also spend a lot of time pondering its idiosyncrasies, but we don't necessarily investigate them, or the actual contacts that we make.

What you are reading is the result of an in-depth investigation by Bob Brown, NM7M, a topband enthusiast who happens to be a retired professor of physics who is into log data for antipodal/near-antipodal contacts on 1.8 MHz using readily available propagation mapping software. What Steve Ireland, VK6VZ, and Mike Bazley, VK6HD—keen topband DXers and the providers of this data—discovered through Bob's work is that the conventional beliefs they had held for many years about antipodal/ near-antipodal propagation had much in common with the beliefs of those who thought the Earth was flat.

Bob's analysis of 1.8 MHz contacts between VK6 (near Perth, Western Australia) and Jack Leahy, VE1ZZ (44.7N 63.6W, near Halifax in Nova Scotia), and later between G/GM/GW (the United Kingdom) and ZL (New Zealand)[1]



Steve Ireland, VK6VZ, and his two children, Sam and Hannah, at Glen Forrest, near Perth. Steve currently has worked 178 DXCC countries and 33 zones on 1.8 MHz.



Mike Bazley, VK6HD, at his station in Albany, Western Australia, some 400 miles southeast of Perth. Mike was the first Oceania station to make DXCC on 1.8 MHz and the first VK to make WAS on the band. Mike currently has worked 225 DXCC countries and 39 zones on 1.8 MHz.

**Please contact the authors c/o VK6VZ, P.O. Box 55, Glen Forrest, Western Australia 6071, Australia*

[1]Footnotes and references will appear at the end of Part II.

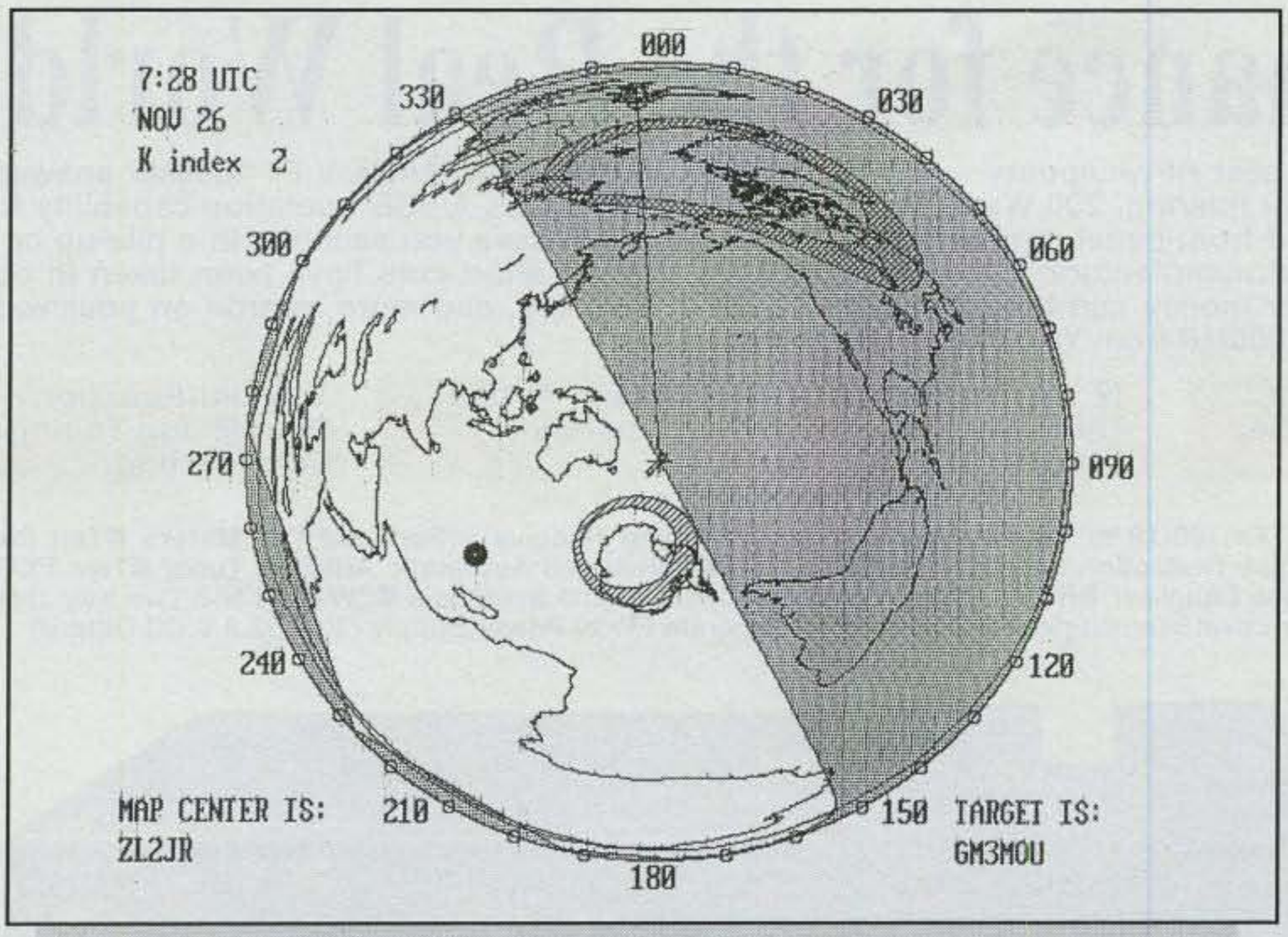


Fig. 1– Azimuthal equidistant map for ZL2JR's short-path contact with GM3MOU on November 26, 1993. See text for more information about azimuthal equidistant mapping.

using the DXAID software[2] showed that seasonal changes in sunlight with regard to the Earth's polar caps actually can have the effect of *switching propagation* on these DX paths, and others of similar distance, from short path to long path and vice versa—a radical concept.

This switching occurs around the time of the equinoxes, the time in each hemisphere when the sun crosses the equator and the lengths of daylight and darkness are equal. To give an example, contacts between VE1 and VK6 at VE1 sunrise that occur *after* the 23 September equinox are actually *short path* in nature, although the conventional wisdom is that they are long path. Only those contacts between VE1 and VK6 that occur *before the 23 September equinox and after the 23 March equinox* are actually long path.

This phenomenon can be termed *equinoctial path switching*, which is also displayed by contacts between the United Kingdom and New Zealand. Contacts between G/GM/GW and ZL at UK sunrise after the 23 September equinox are actually short path in nature (not long path as conventional wisdom would have it), because the southern polar cap is illuminated, as propagation software that carries out azimuthal equidistant mapping, such as DXAID or W6ELProp[3], clearly shows.

Now if all of this sounds reasonable, what about contacts that occur between VK6 and the northeastern USA—specifically the W1 New England states that are geographically close to VE1? Does path switching still occur in the same manner as between VE1 and VK6?

The answer is that path switching *does* still occur, but instead of this being with the passing of the equinox/changing of the season, it happens with the *daily* passing of time—i.e., from dawn to dusk. Contacts made between W1 and VK6 on 1.8 MHz at W1 sunset are always long path, whereas those at W1 sunrise are always short path, *whatever the season*.

Whereas the first type of switching described can be termed *equinoctial path switching* (i.e., switching during the equinox), the second type can be referred to as *diurnal path switching* (i.e., switching during the day).

The fact that the mode of propagation can change so drastically—from the first to the second type—by moving one end of the path by a mere few hundred kilometers probably seems very strange, but there is a simple, logical explanation. The difference in paths between the VE1–VK6 contacts at/near VE1 sunset and the W1–VK6 contacts at/near W1 sunset comes down to the relative difference in longitudes and how paths fall relative to the polar circles.

Another way to look at this difference between equinoctial-switched (VE1–VK6 and G–ZL) and diurnal-switched long-distance paths is to consider an equinoctial-switched short-path contact that took place between GM3MOU and Jim Robertson, ZL2JR, on 26 November 1993 around UK sunrise[4] (see fig. 1). If you look at the difference in longitude between the locations of GM3MOU and ZL2JR, it is about 178 degrees, which DXAID or W6ELProp will show puts the (short path) contact right over the center of the northern polar cap. However, if you consider instead a path that runs equator-ward of the Arctic Circle at the same UTC, then equinoctial switching no longer occurs and instead the type of contact becomes diurnally-switched (and long path) instead.

If all this seems a bit bewildering, let's look at some of the basics of 1.8 MHz propagation.

Darkness

With ionospheric absorption so great on the 1.8 MHz band, DXing along a particular path must be done during the hours of darkness. This requirement brings up the matter of the systematics of darkness itself.

Up until a few years ago, working this out with regard to 1.8 MHz DXing involved identifying the times of common darkness between your location and that of the particular DX station you desired to contact. This meant using sunrise/sunset tables for both your own and the DX station's location in order to find how long the window of opportunity for a contact potentially could last. However, these days we are blessed with several very effective software programs, such as DXAID and W6ELProp, which carry out what is termed *azimuthal equidistant mapping* and enable a much faster, simpler, and broader way of looking at sunlight and darkness in terms of radio propagation.

With software carrying out azimuthal equidistant mapping, the first thing you must do is configure it (by entering your latitude and longitude) so that the entire Earth is shown on one circular projection with your location at the center. Times of sunset and sunrise are shown as maps, with half the Earth dark to the east or west, respectively (see fig. 2).

One useful feature of this kind of mapping projection is that all great circles from the central origin of the map are actually straight lines, and distance is measured in a linear fashion out to the antipodal point on the opposite side of the Earth, 20,000 km away, which has been distorted into a circle.

After sunset the oval of darkness, covering the eastern half of the Earth, grows smaller on the map and moves around in a clockwise fashion. At local

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Jack Leahy, VE1ZZ, in his radio shack near Halifax, Nova Scotia. VE1ZZ has been working VK6HD on 1.8 MHz for over 30 years, since about 1970 when Jack was using a dipole antenna. These days he has a 4-square vertical array. (Photo courtesy Jeff Briggs, K1ZM, from his book DXing on the Edge—The Thrill of 160 Meters, *published by the ARRL and reprinted by permission).*

midnight the oval is at its smallest and centered in the middle of the map, over the anti-solar point (i.e., the point on the Earth's surface farthest from the Sun). Then the oval grows larger again, rotates more clockwise to the west, and finally covers the western half of the Earth on the map at sunrise.

Just by simple inspection of an azimuthal map, minute-by-minute or hour-by-hour, you can see where the boundary of the area of common darkness extends. This tells us when a particular DX path *can* be worked on 1.8 MHz (during the time of darkness after sunset) and when it *cannot* (during the period of daylight after sunrise). In that regard, the huge differences in ionospheric absorption—from darkness versus daylight—serve to separate out those paths which are viable on 1.8 MHz in a physical sense and those which are not. However, there is more to the "systematics of darkness" with regard to 1.8 MHz propagation than simply changes from darkness to light. This is best seen in another form of mapping, the familiar Mercator projection, which can be generated by DXAID, W6ELProp, and grayline prediction software programs such as Geoclock.

Unlike the azimuthal equidistant projection which has no symmetry to it since the centers of maps drawn using it center on a particular location (which is chosen on a case-by-case basis), the Mercator projection has symmetry and is always the same, as it is centered on the geographical Equator. However, in the Mercator projection the map distortions increase as we move away from the Equator, and the points for the Earth's poles are mapped as straight lines.

While azimuthal equidistant maps may include the auroral zones, they are usually without indication of the parallels of latitude or lines of longitude. It is just the opposite in the Mercator projection, with a scale of latitude and longitude indicated on each projection and often supplemented by the auroral zones. However, in a Mercator projection, the *lines of latitude* for the Tropic of Cancer and the Arctic Circle, as well as those for the Tropic of Capricorn and the Antarctic Circle, are not given. Those lines of latitude are important to the present discussion and indicate extremes for the location of the sub-solar point (23.5 degrees above or below the equator in summer and winter, respectively) and the extent of polar illumination and darkness during a year (23.5 degrees from the poles at the solstices).

The boundary of the hemisphere of darkness is known as the *terminator* and is represented in the Mercator day/night projection (as used in radio propagation prediction tools such as Geoclock, DXAID, W6ELProp, and the DX Edge slide-rule) as a sinusoidal line, dividing the sunlit and dark regions, and assuming a more squared-off shape around the equinoxes, when the two hemispheres are equally illuminated by the sun at the equator. In addition, the terminator moves in both latitudinal and longitudinal directions over the course of time.

The latitudinal motion of the terminator is the slower of the two, moving northward toward the winter solstice after the September equinox and southward toward the summer solstice after the March equinox. In contrast, the longitudinal motion of the terminator is from east to west during the course of a day.

In any event, the basic rule for propagation on 1.8 MHz remains the same whatever the time of year: *Those paths which lie within the dark regions are viable for DXing and those which fall within sunlit regions are not.*

Propagation Paths

In discussing propagation paths, the great-circle lines radiating out from the location of a particular transmitting/receiving site are very useful. It must be

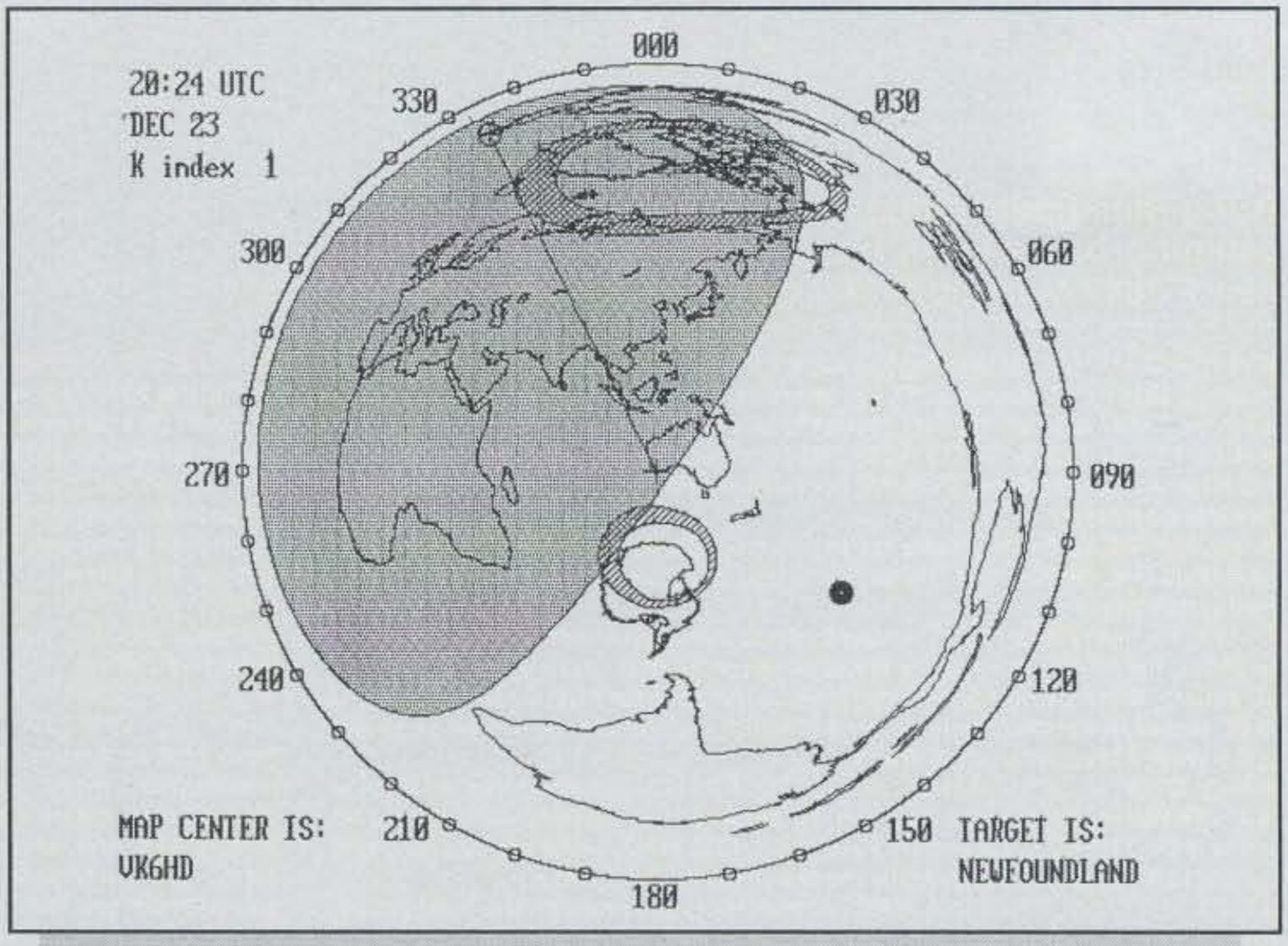

Fig. 2– Azimuthal equidistant map for VK6HD's short-path contact with VO1NA on December 23, 2000.

remembered, though, that great-circle lines are purely geometrical constructs, being in a vacuum and quite different from "real" radio paths where there is an ionosphere present above the Earth in which radio waves travel and are reflected/refracted until they arrive at a destination.

Thus, in the real world great-circle lines can offer a useful *approximation* for those paths where the higher parts of the *HF* radio spectrum are used and where skewing by horizontal gradients of ionization is the least.

Wave refraction, which causes skewing of the paths of radio signals to occur, varies roughly by the square of the wavelength involved. As a result, while skewing away from the great-circle directions on 28 MHz (wavelength of 10 meters) is minimal for any electron density gradients that are encountered, on 1.8 MHz (wavelength of 160 meters) skewing will be much greater—roughly 250 times that which can occur on 28 MHz! As a result, great circles serve more as an *indication* of the directions that signals follow on 1.8 MHz rather than the actual paths, due to the great amount of skewing that occurs as a matter of course on this relatively low frequency/large wavelength.

The "real" paths that radio signals follow on 1.8 MHz can be predicted more accurately by using what scientists refer to as *ray tracings* with model ionospheres, rather than just pure geometry. Even then, these ray tracings would only be appropriate for average radio conditions and would not take into account the daily variations or fluctuations that can result from the occurrence of geomagnetic or auroral disturbances.

All of this is scene setting, but very important in understanding the mechanics of how the seasonal changes in sunlight in the Earth's polar caps can actually have the effect of switching propagation on some DX paths from short path to long path and vice-versa. Now that this has been done, let us return to the real subject of this article.

Of great interest to DXers are the circumstances, the "when" and "where," of long-haul contacts which lie close to the 20,000 km distance that separates short-path from long-path propagation. That is particularly the case on medium-frequency bands such as 1.8 MHz because of the strong role that absorption of radio signals by the ionosphere plays in limiting their propagation.

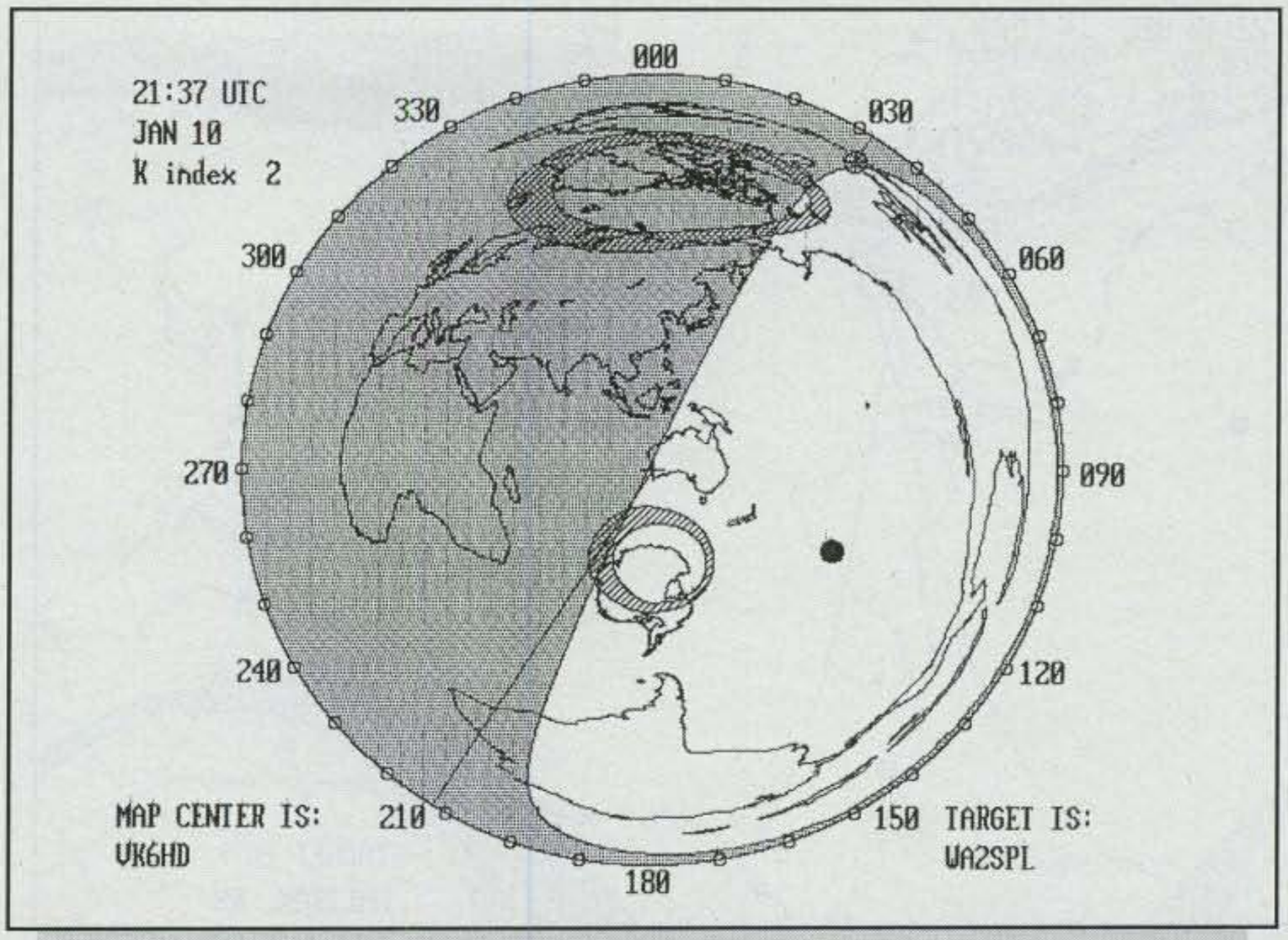

Fig. 3– Azimuthal equidistant map for VK6HD's long-path contact with WA2SPL on January 10, 1984.

Real-Life Examples

Let us now look at some examples of such long-haul contacts, in particular at how the systematics of darkness allow them to occur. The paths will be between Western Australia and the northeastern part of North America and are obtained from the logs of VK6HD and VK6VZ. In that regard, short paths will be those wholly within the dark hemisphere, while long paths covering more than 20,000 km will have some portion in sunlight, beyond the dark hemisphere.

The first contact to be discussed is between VK6HD, operating from Albany, Western Australia (35S, 118E), and VO1NA, Torbay, Newfoundland

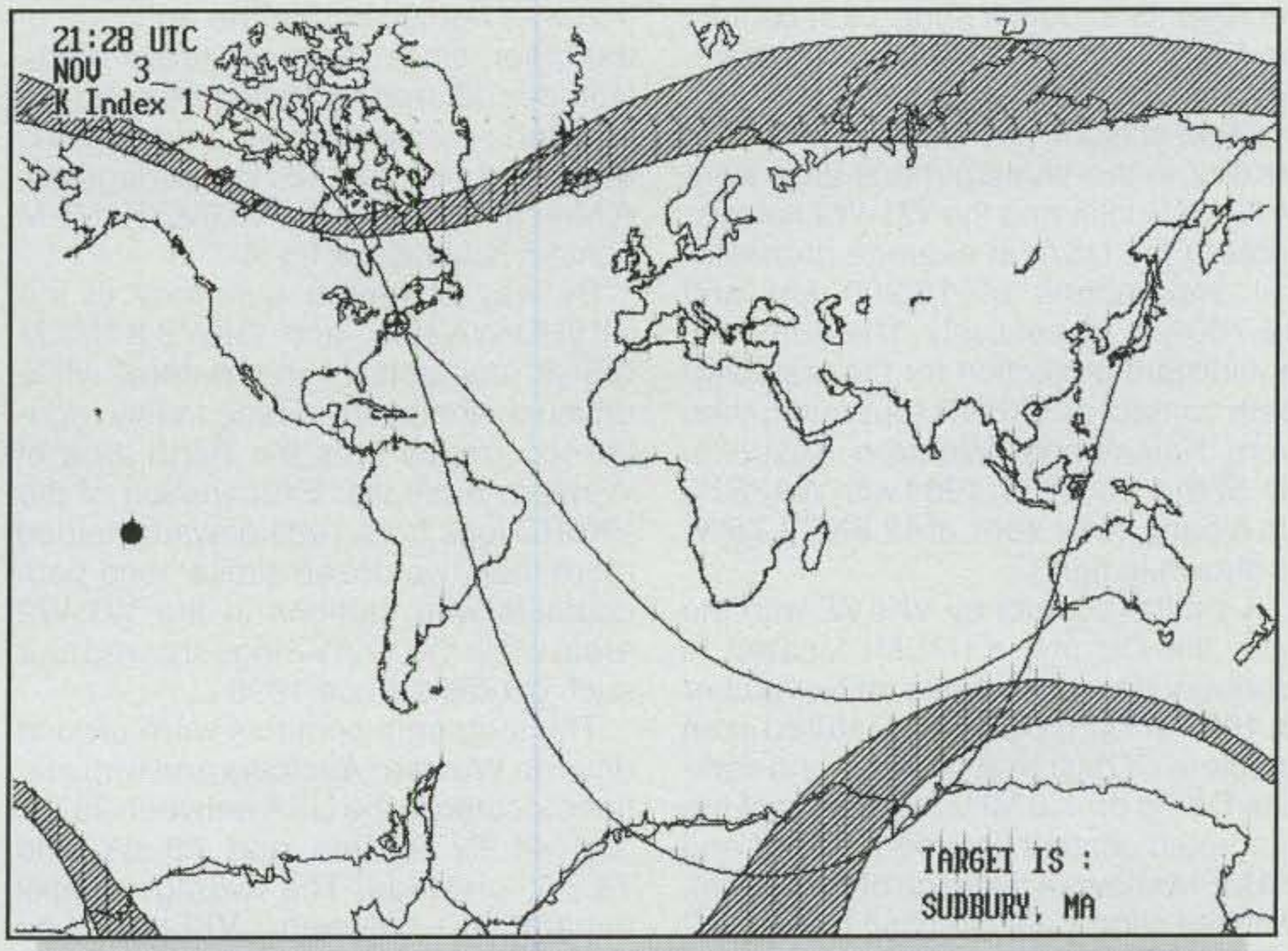

Fig. 4– Mercator map for VK6VZ's long-path contact with K1MEM on November 3, 1997.

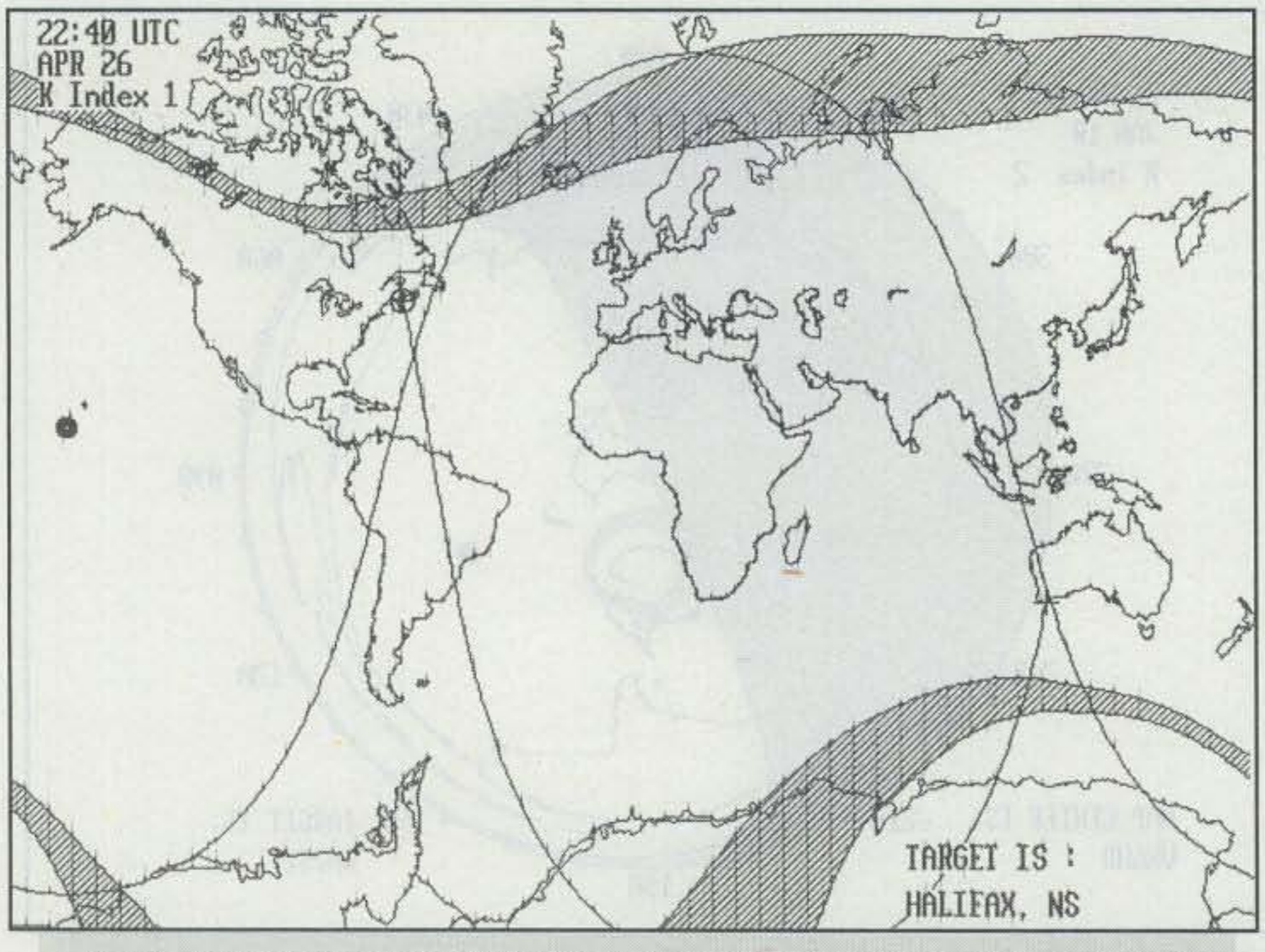

Fig. 5– Mercator map for VK6VZ's long-path contact with VE1ZZ on April 26, 1999.

(47.7N, 52.7W). The date and time of the contact was December 23, 2000 at 2024 UTC, with the geometrical separation of the two stations at 18,404 km shown in the azimuthal equidistant map (fig. 2).

Except for the distance, falling 1600 km short of meeting the long-path requirement, the VK6HD/VO1NA QSO represents a routine short-path contact on 1.8 MHz and is contained completely within the dark hemisphere.

Other stations worked by VK6HD and VK6VZ in this same general area were in Nova Scotia and the W1-W2 call districts in the USA, at average geometrical separations of 18,900 km and 18,700 km, respectively. The azimuthal equidistant projection for the first long-path contact of VK6HD (operating then from Kalamunda, Western Australia, 31.57S, 116.03E) in 1984 with WA2SPL (in Albany, New York, at 42.8N 73.75W) is shown in fig. 3.

A similar contact by VK6VZ with the late Jim Dionne, K1MEM, located in Sudbury, Massachusetts on November 3, 1997 at 2128 UTC was featured in an article in *CQ* last year on gray- and dark-line DXing on 1.8 MHz.[5] Analysis of the long-path contact between VK6VZ and K1MEM shows a distance of 21,400 km, with the short-path direction to the NNE of Western Australia being ruled out because of bright sunlight in that direction, similar to that in fig. 3.

As to how the long-path VK6VZ/K1MEM contact took place, the end points of the path were just in sunlight (although the point[s] of refraction of the signals in the ionosphere were probably just into darkness) as it took place a few minutes before sunset in Sudbury and a few minutes after sunrise in Perth. This resulted from the fact that one station was not located at the antipode of the other, since the magnitudes of the latitudes differed by 10 degrees and the longitude separation of the stations exceeded 180 degrees by six degrees. A Mercator map for the VK6VZ/K1MEM contact is shown in fig. 4.

By way of further summary of the VK6HD/WA2SPL and VK6VZ/K1MEM QSOs, contacts of this nature, while unusual, are clearly a reasonably regular occurrence from the Perth area of Western Australia. Examination of the VK6HD logs from 1984 onward yielded more than two dozen similar long-path contacts with stations in the W1-W2 area, while the VK6VZ logs showed four such contacts since 1995.

The long-path contacts were around dawn in Western Australia and with stations located in the USA between 39.9N and 44.9N latitude and 68.8W and 74.7W longitude. The average spatial separation between VK6HD and VK6VZ and those stations in North America was 18,665 km. However, the average separation for all the radio contacts was 21,385 km, or 2720 km beyond the short-path distance.

The geomagnetic circumstances surrounding these long-path contacts were examined using the *Ap* and *Kp* sums for each day. As might be expected, the magnetic activity was low, with an average *Kp* of 2. On this basis, since magnetic activity is not an issue in this instance, it will not be considered further in this analysis.

More important to the present discussion are the contacts that VK6HD and VK6VZ have had with Jack Leahy, VE1ZZ (near Halifax in Nova Scotia, at 44.7N, 63.6W), close to the former's sunrise. The logs of VK6HD revealed more than 150 contacts with VE1ZZ over a 20-year period (from 1981 to the present), while the logs of VK6VZ contained 68 contacts since 1995. The vast majority of the contacts were before sunrise in the northern hemisphere fall/winter/spring months, September to March, and short-path in nature with an average separation of 18,600 km. With such a large number of regular contacts by VK6HD and VK6VZ with one particular location (VE1ZZ), this amounts to something like a long-distance professional communications circuit and allows greater understanding of propagation than just casual contacts with a variety of DX locations.

By far the most interesting of the contacts between VK6HD/VK6VZ and VE1ZZ, however, lie *outside* the September to March period. During the period after the March equinox and before the September equinox (northern spring and summer), VK6HD made a dozen contacts with VE1ZZ, while VK6VZ made two.

Instead of the short-path propagation which occurs from VK6HD/VK6VZ to VE1ZZ during September to March, those that occurred outside of this period but in a similar daily time frame (near sunrise at VK6, near sunset at VE1) were all long-path in nature, *clearly showing a switch in path with season.*

An example of these VK6HD/VK6VZ long-path contacts with VE1ZZ is shown in the Mercator projection in fig. 5, obtained using DXAID.

Coming Up in Part II

In Part II we'll take a closer look at the mechanics of these less-frequent contacts, other factors that may affect long-distance propagation on 1.8 MHz, and whether a path assumed to be open only part of the year might actually be available year-round. ■

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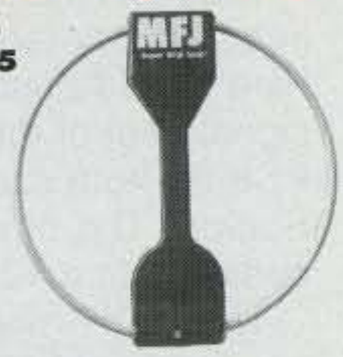

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CQ Reviews:

The AOR TDF-370 Multi-Media Terminal

BY GORDON WEST,* WB6NOA

My friend Taka, KW6I, at AOR called me and said I immediately needed to drive up to Los Angeles to hear his latest breakthrough in audio technology—a ham station accessory that would take digital signal processing and put it into a set of stereo headphones or a speaker like nothing I had never heard before. Taka Nakayama, AOR's Executive Vice President for the Americas, and I go back a long way, so I knew he had something really exciting that could make ham radio operating more enjoyable on the high-frequency bands . . . and on the VHF and UHF satellite bands, plus the microwave bands. I had to listen for myself!

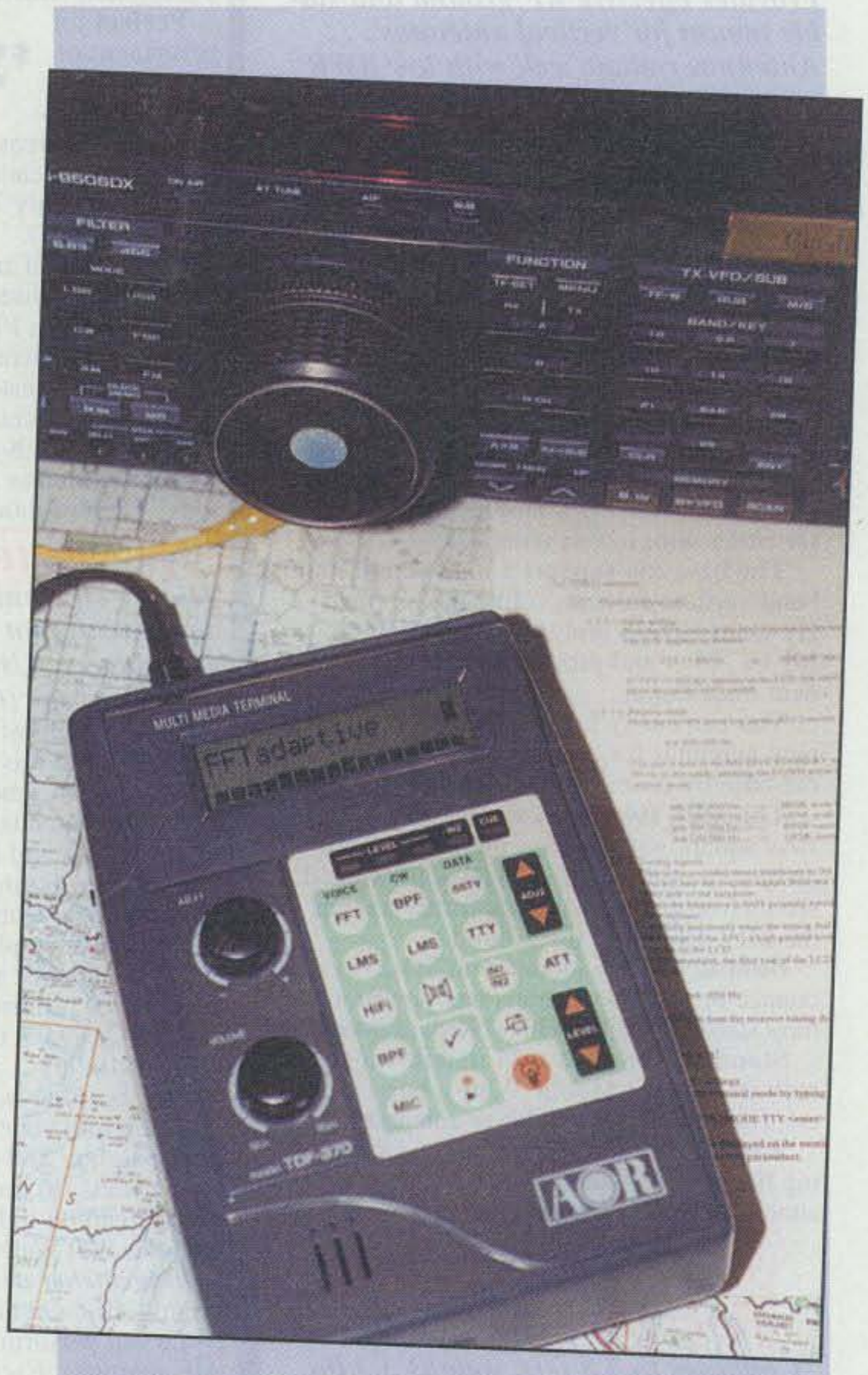
The AOR Multi-Media Terminal, model TDF-370, is a plug-in accessory terminal that will work with almost any type of ham radio transceiver. It's a powerful workhorse for pulling signals out of the high-frequency bands as well as copying PSK 31 from satellites or ultimately the International Space Station. The box runs on 12 volts DC or 4 AA batteries. It comes with a 12 volt power cord, but not the wall wart.

The AOR multi-media terminal uses digital signal processing to enhance voice signals on both receive and transmit, along with DSP filtering for CW and digital modes. It comes with a rear-panel DUSB 9 connector and a serial cable to send and receive PSK 31 and RTTY using a simple terminal program, plus it can transmit and receive slow-scan television with optional AOR software. However, by itself, on the little LCD screen it can display streaming PSK 31 and RTTY reception!

It is also a digital voice recorder, storing up to 102 seconds of audio in 8 memories. It has a built-in microphone equalizer to enhance transmit audio, and controls that allow you to set the vocal characteristics of your particular microphone system.

On CW the AOR terminal has built-in 100, 200, and 300 Hz audio DSP band-pass filters. You may select a center frequency from 450 Hz to 800 Hz in 50 Hz steps, and 100, 200, and 300 Hz bandwidths. There is also an added DSP bonus of noise reduction in the CW mode.

For voice, an AOR first is "fast fourier transform" audio filtering, claimed to create a more natural sound while listening to voice in the DSP-on mode. There is also an auto-notch

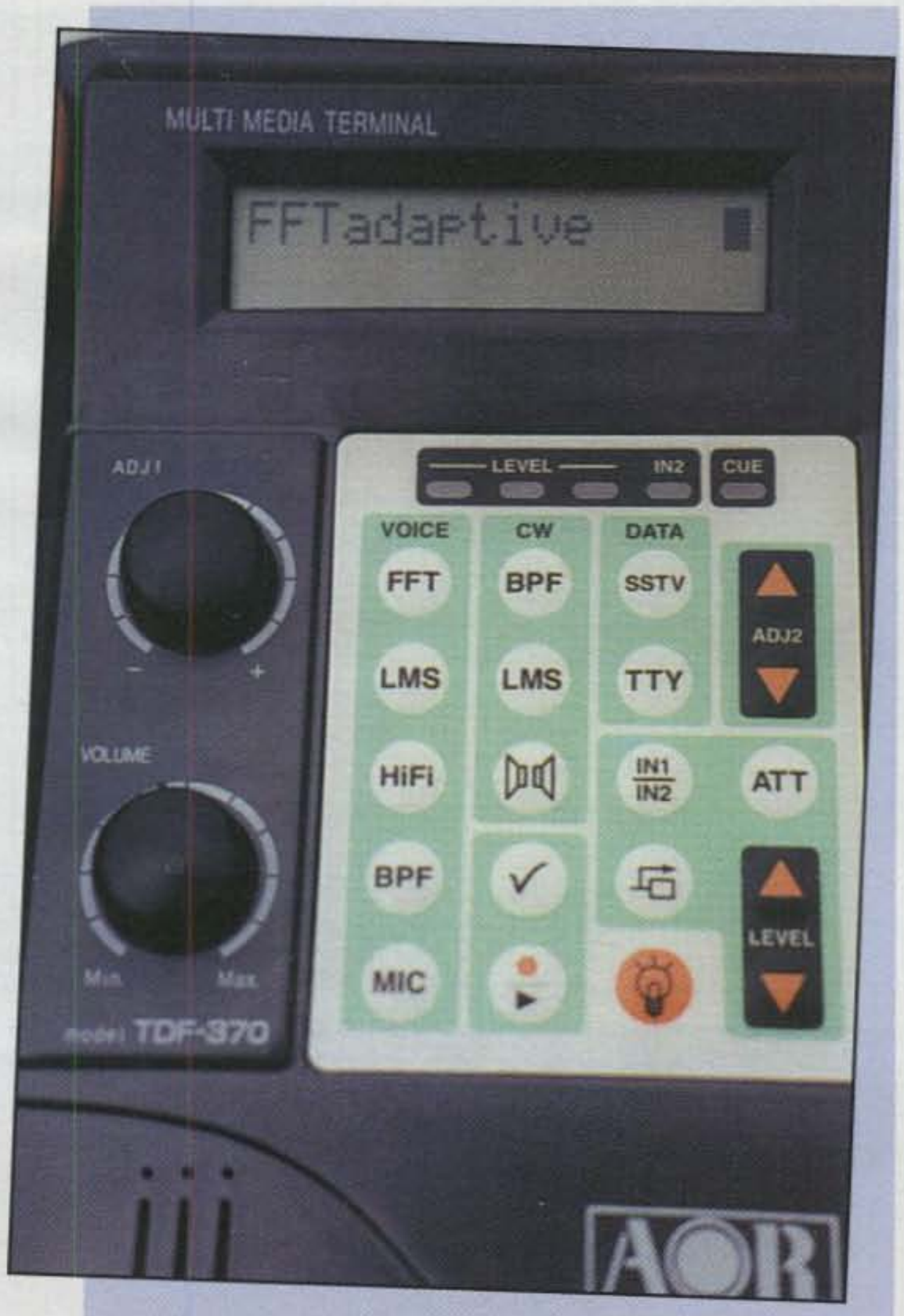


The AOR TDF-370 Multi-Media Terminal is an outboard digital signal processing unit with features to enhance voice, code, and digital reception, along with microphone equalization on transmit.

*CQ Contributing Editor at Large
2414 College Dr., Costa Mesa, CA 92626
e-mail: <wb6noa@cq-amateur-radio.com>

Close-up of the TDF-370's LCD screen. It will receive PSK-31 and RTTY signals without any additional software.

Rear connections on the TDF-370 include 12 volt DC power, audio inputs and output, plus a com port for connecting to a computer.



Touch buttons on the front panel allow you to customize the TDF-370 for the type of signals you are working with.

function if you operate much down on the 40 meter band and need to dodge a heterodyne.

When I arrived at AOR, however, Taka said he wanted me to listen to an HF SSB signal such as I had never heard before. On went the little earbuds (supplied with the equipment), and *voila:* It was like listening to the incoming SSB in the third dimension with concert-hall clarity. They call it "stereo," and however they do it, the audio processing is like listening to incoming audio coming out of Bose speakers! Talk about depth.

Listening to voice in the DSP mode indeed had a slightly different sound of noise reduction than what I am accustomed to with my Kenwood DSP radio and my other rig with a Clear Speech audio system. The adjustment knob and undulating bar graph allow me to set the DSP noise reduction just to the point of hushing background noise, while still allowing good audio characteristics to come through without any "rolling" sound. Indeed, the recovered audio from relatively noisy band conditions was free of background hash, and the fidelity of the DSP signal was very good, especially over the high-fidelity type audio output section of the terminal which can go to the supplied earbud speakers or an external mono or stereo speaker system.

On CW the AOR terminal shines with band-pass filtering, adjustable center frequency and bandwidth, adaptive filter switch, variable noise reduction, and a most interesting control called "stereo band-pass filter," which processes signals through the FIR filter to obtain stereophonic-like CW signals that take the harshness out of contesting.

I was most interested to see how well the AOR TDF-370 would receive PSK 31 all on its own without a computer. It did, but it will take you at last a half hour to get the hang of it and recognize the stereophonic high and low tones that come out of one side of the headphone, which is supposed to tell you when you are getting close to perfect tuning. With PSK 31, too, just a few hertz off and the reception won't read out on the screen. However, once you are on and you hear a thunking noise in the right headphone (they call it *zero beat*), you get surprisingly good PSK 31 reception. In fact, it's just as good as my dedicated computer for PSK 31!

I tried it on RTTY, where the tuning is not as critical, and I saw the string filling up the LCD display and then running from right to left.

In the digital mode I kept looking at a couple of the red and green light-emitting diodes to see whether or not they would

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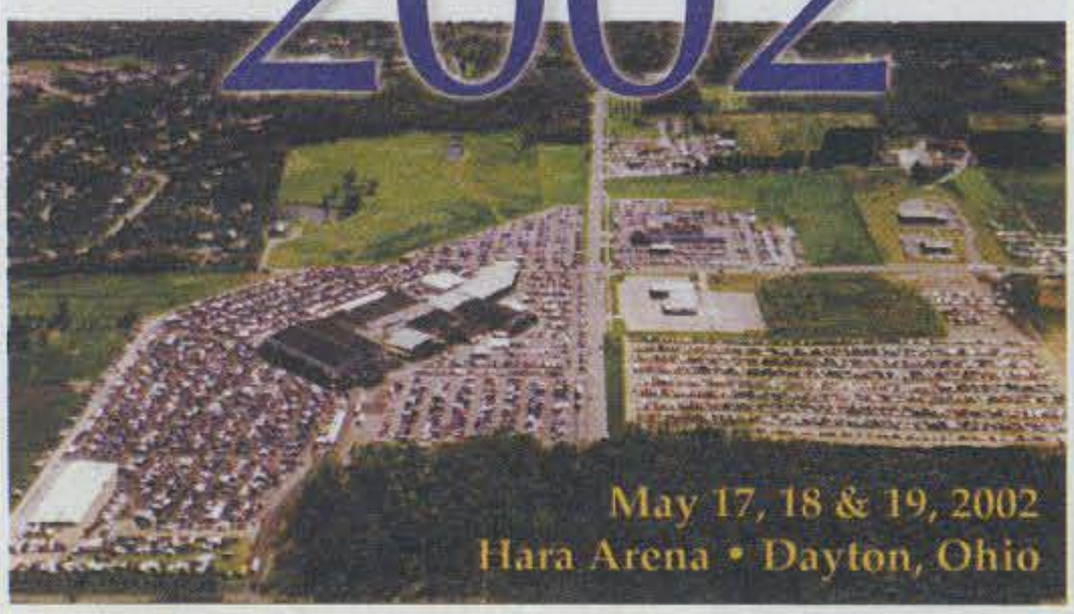

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be an indication of proper tuning. Unfortunately, they are not. You must rely on your ears, not your eyes, for tuning in PSK 31 and RTTY.

I was surprised that with all the neat features of PSK 31 and RTTY decode, AOR did not include CW decode—or APRS strings. Nope, not in the unit and not planned. Oh, well! When I get the software, I'll try the SSTV.

The digital voice recording worked swell. In the recording mode the terminal captures audio starting 6 1/2 seconds *prior* to when you pressed the start button. This is a neat feature. It allows you to capture and retain information that passed through the unit prior to the record command, and this way you can capture something that you just discovered was important to save.

When we hooked it up to my laptop, it behaved as a smart terminal unit, giving us all of the features we just talked about, plus on-screen buffers for transmit. However, don't expect the add-on computer to bring up all sorts of neat tuning indicators that you might already have with your sound card and another terminal program for the digital modes. Again, the AOR terminal unit is best adjusted with the earbuds firmly in place!

Best of all, the terminal is completely portable. If you decide to hang a portable HF rig over your shoulder and run the audio into the AOR terminal unit running on AA batteries, your earbuds will hear the difference! This makes it the perfect take-along for doing serious operating at someone else's station.

You can see the AOR TDF-370 at your local ham radio store, but you must listen to it to appreciate it. For more details check out the website <http://www.aorusa.com>, but again, looks are deceiving. This relatively simple device really takes ham radio receive signal processing to a new dimension, whether you are into data, CW, or voice. ■

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When Yaesu introduced its all-band, all-mode, HF/VHF/UHF portable FT-817 transceiver, it simultaneously energized the amateur radio accessory makers to develop products to enhance the field-operating capabilities of this tiny transceiver. Here's a look at a few of the possibilities.

Accessories Galore for the Yaesu FT-817

BY GORDON WEST,* WB6NOA

When we reviewed the FT-817 last April, reviewer Bruce Prior, N7RR, dedicated a full page to describing some of the many accessories that had been introduced to support this radio. The new products keep on coming, though, and the ones we tell you about here are not on that original list, and I'm sure we haven't gotten them all this time, either! This is a radio around which an entire sub-industry is being built. — W2VU

The Yaesu FT-817 has become such a portable DX "hit" that when you tell someone in another country you are operating portable QRP at 2½ watts, they immediately acknowledge that your FT-817 is doing a marvelous job (even if you hadn't yet mentioned what rig you're using). This little HF/VHF/UHF transceiver has become so popular so quickly that "accessories for the 817" are showing up all over the place, some from established accessory manufacturers and others from newcomers to the amateur marketplace. Some of these accessories work well, while others that we tested produced only marginal results. We'll start with antennas.

Portable HF Antennas

I wanted to test the performance of BNC, base-loaded, HF, single-band and multi-band telescopic whips versus cut-to-length, tiny-wire dipoles that you hang in a tree. Working with Yaesu's Chip Margelli, K7JA, we tried a wide variety of possibilities, and we were very pleased to work everyone we could hear on our 817 with the dipole in the tree as an inverted-Vee, an inverted-L, and even as a vertical ground plane with the addition of a one-quarter wavelength radial. The tiny-wire dipole got through on every call.

Next we switched to a variety of homebrew and commercially available whips, starting with a brand-new commercial tri-band, base-loaded, BNC whip tuned for 10, 15, and 40 meters. We took our portable QRP 817 "system" out on a dock, over a pond, to achieve the ultimate in counterpoise ground potential for the loaded-whip system.

The results were disappointing. Unlike the simple halfwave dipoles, the tri-band HF whip didn't make the grade. Every European station that we had contacted earlier, still pounding in at 10 over S9, didn't hear a whisper from us

Yaesu's Chip Margelli, K7JA, operates the FT-817 with a Heil headset mic and a loaded whip for 40, 15, and 10 meters. The mic worked better than the antenna.

Gordon shows off a simple dipole with which the FT-817 was able to work any station it heard.

**Contributing Editor, CQ, 2414 College Dr., Costa Mesa, CA 92626*
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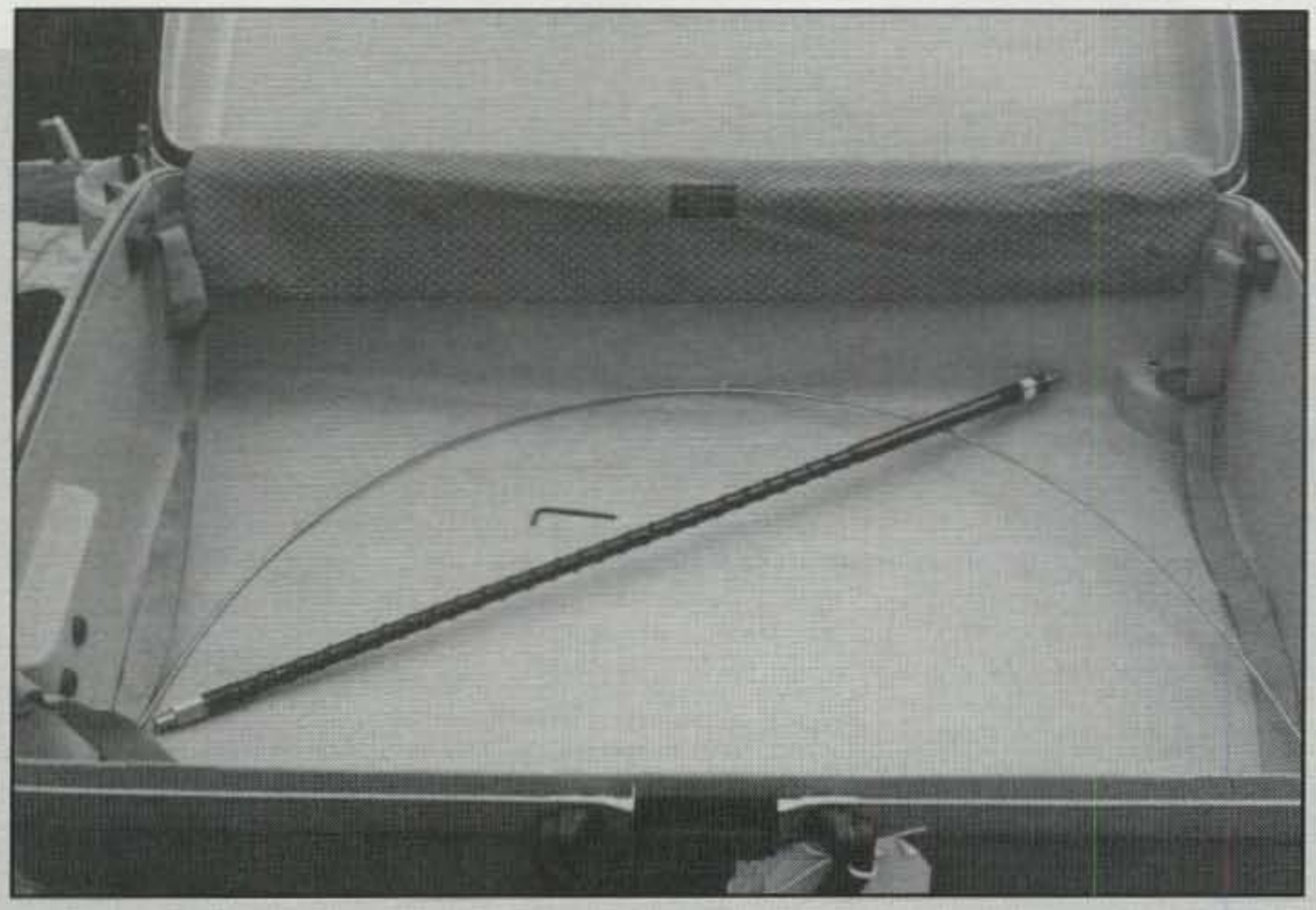

Antenna World's short-shaft HF whip can be packed into a suitcase for portable operation from just about anywhere.

The SG-239 Smartuner from SGC will match virtually any wire antenna for portable use with the FT-817, SGC's own SG-2020, or other QRP radios.

as we tried to answer their CQs. Finally, we did manage to get an S0 report from one Italian station pounding in 40 over 9, indicating he could just barely hear something calling him above the noise.

I think a little flexible whip antenna for 10 meters with a little bit of center loading might be practical on the 817's BNC jack, but I see little chance of success with a relatively short base- or center-loaded 15 meter whip, and would anticipate no skywave capability with a very short 40 meter BNC-type whip. While I applaud BNC-type whip manufacturers for trying to come up with a portable tri-band antenna, the losses are so significant in base loading an extremely short whip that getting any type of skywave signal response will be tough.

When we went back to the dipole in the tree, the little FT-817 sprang to life, and anyone we heard calling CQ responded with S5–S7 signal reports. Therefore, it looks as if you are best off using some sort of external antenna, and that means getting it connected without undue strain on the 817's antenna jacks.

Tom Glaze, K4SUS, a well-known VHF/UHF operator, comments, "A weak area for any HF or VHF/UHF radio operating portable or mobile into an external antenna system is the connection between the radio's output jack and the big incoming antenna coax connector." Glaze works with Antenna World <www.antennaworld.com> in Miami, Florida, which has tried to solve that problem by producing special patch cables for handhelds and the FT-817. The double-shielded RG-174 type cable with reinforced connectors on each end "takes the strain off of the SMA or BNC connectors on the radio when hooking up to a mobile or portable antenna system," explains Glaze, showing off several varieties of patch cables with negligible insertion loss at VHF/UHF frequencies. He adds that the most popular cable sold at the recent Dayton Hamvention™ was the jumper to the BNC jack on the FT-817.

Antenna World also manufactures lightweight, short-shaft HF whips ideally suited for the FT-817 (or any small HF radio) user who needs to get everything into a small suitcase for operating "rental car mobile."

Other HF mobile/portable antennas we looked at included Anttron's <anttron@juno.com> heavy-duty, 4 foot shaft, 50 inch stinger, single-band "Ham Whips™." We chose the Anttron whips as our benchmark because of the large-gauge wire used in the 4 foot shaft loading coil and the relatively heavy .125 inch stainless steel whip with double set screws. Only Antenna World cuts the shaft length in half for suitcase portability in operating the new breed of very transportable HF transceivers. The Alpha Delta triple-breakdown whip also divides up nicely into three 2 foot sections plus their yard-long, stainless-steel-tip whip.

Yet another creative product for taking a hike with the FT-817 or any 2 meter transceiver is the hollow PVC Walking Stick antenna from Creative Services Software <ricker@cssincorp.com>, available in long or short length for kids and adults. Inside the PVC tube is a coaxial dipole, cut and matched for the 2 meter band, with an SO-239 connector at the bottom (covered with a PVC cap when not in use). Add some coax (and maybe an Antenna World jumper) and you're all set. You can pull the antenna up into a tree and dramatically improve your 2-meter range, or hang it indoors during a thunderstorm to stay on the air. It doubles as a sturdy hiking stick when not in use.

Goin' Long...

If you're thinking of working the FT-817 out in the back country or along a river

or stream and would like fully automatic long-wire antenna tuning, two companies have now introduced lightweight, portable, fully automatic, fully active, relay-switching antenna couplers—well-respected SGC <sgc@ sgcworld.com> and a relatively new automatic antenna tuner manufacturer, LDG Electronics <http://www.ldgelectronics.com>. Within five days of each other, both manufacturers introduced small, low-cost, low-power automatic couplers that are likely aimed at portable Yaesu FT-817 operation.

Both tuners take the output of the FT-817, or any other QRP-style transceiver, and effectively match it to any length long wire, loop, or dipole configured antenna. The SGC SG-239 and LDG Z11 both need a little bit of 12 volt DC to operate the relays that pull in thousands of combinations of capacitance and inductance.

I worked with both pieces of equipment in a marine installation, tied into an overboard ground system. Results were checked with an MFJ RF antenna current meter, along with a small fluorescent tube temporarily taped onto a section of the radiating antenna cable. Both tuners did an excellent job matching an SGC-2020 transceiver on all ham bands, plus both tuners did a quick tune-up with the Yaesu FT-817 on low power. *(Let us know if you're interested in learning more about Gordon's "overboard ground" experiments; if there's enough interest, he'll write it up in more detail.—ed.)*

Keep in mind, however, these automatic tuners are going to add another 200 milliamps to your battery budget, so you may wish to consider a small external gel battery system to keep things up and running. In fact, the 817's power consumption is one of the rig's few negatives, so we took a look at alternatives to the supplied battery pack.

Extending Battery Life

One of the first observations about the Yaesu FT-817 was its need for a good supply of batteries to keep it running portable—even on squelched receive. Unlike a handheld dual-band transceiver which may only draw 80 milliamps squelched and 110 milliamps with audio at mid-volume, the Yaesu FT-817 was measured drawing 248 milliamps squelched and over 400 milliamps with mid-volume audio output. It is understandable to see this elevated current consumption, based on the fact that both the HF and VHF/UHF receiver circuits are "hot" whenever the radio is on, and the little 817 has plenty of audio output—far louder than a typical HT—and more audio output means additional current drain.

The FT-817 ships with the FBA-28 holder for alkaline AA cells. The instruction manual illustrates about five hours of alkaline battery life when running the equipment on squelched VHF/UHF repeater monitoring, along with some time on HF unsquelched, and some brief periods of transmitting on either HF or VHF/UHF.

When we tested the 817 on premium, long-life alkaline batteries, we found we could easily exceed five hours with the equipment mostly squelched and very little transmitting, but could easily eat up battery time with a lot of transmitting, which could pull up power consumption to 2 amps on either voice peaks or a little under 2 amps for FM.

We ordered Yaesu's optional nickel cadmium (NiCd) battery pack, FNB-72, rated at 9.6 volts at 1,000 mAh. This pack replaces the alkaline tray and easily plugs in with the miniature, 4-pin micro plug. Our FNB-72 worked well, but didn't go quite as long as our alkaline pack.

Our next trial was taking Maha AA nickel metal hydride (NiMH) cells and loading them into the alkaline tray, now giving us 9.6

Maha's MH-FNB-72 sealed nickel metal hydride (NiMH) battery pack is a direct replacement for Yaesu's nickel cadmium (NiCd) pack for the 817 and provides nearly twice as much operating time per charge.

The "Pack-It" Reference For the FT-817

By Bruce Prior, N7RR*

Following similar products for the Kenwood TM-741 and 742, as well as the Yaesu VX-5R and VX-1R, Hugh McCully, VE3AYR, has produced a comprehensive alternative manual for the portable Yaesu FT-817 transceiver. The *Pack-It* reference, with 141 pages of useful information, is compact enough for you to really "pack it" with the rig, and its spiral binding allows the book to lie flat.

The VE3AYR product is a significant improvement over Yaesu's FT-817 Operating Manual, so many owners will want to keep it handy at their home station operating positions as well as take it on journeys. In addition to detailed descriptions of the many controls and features of the 817, the *Pack-It* includes special tips flagged by a cartoon robot. Even though it's full of technical information, the *Pack-It* is fun to read from cover to cover. After you've finished, both the table of contents and the index are superb tools for finding something in a hurry. Some bonuses are also included, such as IARU band plans, HFPack and QRP frequencies *(HFPack is a group dedicated to hamming while backpacking.—ed.)*, and details about satellite operation.

For more information, see the VE3AYR website at <http://www.bigwave.ca/~janus/hrm/>. Price in US funds is $13.45 including shipping. The *Pack-It* reference may be ordered from FT-817 Book, 610 Barons Ct., Burlington, ON L7R 4E4 Canada, or via e-mail to <ve3ayr@rac.ca>. (N7RR reviewed the FT-817 for *CQ* in the April 2001 issue.)

***853 Alder St., Blaine, WA 98230*
e-mail: <n7rr@arrl.net>

The suction-cup feet of the Bull Dog paddle and its small size make it an ideal companion for "on the trail" (or on the beach) CW operation with the FT-817. ←

volts DC at 1550 mAh. This arrangement gave us an additional hour of play time, but the batteries needed to be removed and charged with a Maha NiMH charging system in order to get replenished. The built-in Yaesu battery charger for the Yaesu battery pack is automatically out of circuit when using the alkaline holder because an extra green wire in the plug connection cancels battery charging that could be dangerous to alkaline cells.

Like any good ham, we figured since the cells we were running were indeed rechargeable, we could cut the little green wire, and the built-in Yaesu charger on both straight 12 volt input to the back of the radio, or 12 volts from the supplied AC adapter, gave us a very nice 6 hour (menu adjustable) charge without overheating the 1550 mAh NiMH cells in the alkaline holder. While Yaesu does not recommend cutting the green wire, almost everyone using rechargeable AA batteries is doing it, and this gives extra playing time when operating the equipment truly in the field.

Maha now offers an MH-FNB-72 NiMH battery pack, sealed up like the Yaesu 9.6 volt DC battery pack, at almost twice the battery capacity. The Maha pack is rated at 9.6 volts DC, 1700 mAh capacity, and during our test it indeed kept our FT-817 running longer than any other internal batteries we had tried before. Maha is well respected in the commercial land-mobile portable-radio battery field, and its new Yaesu-style

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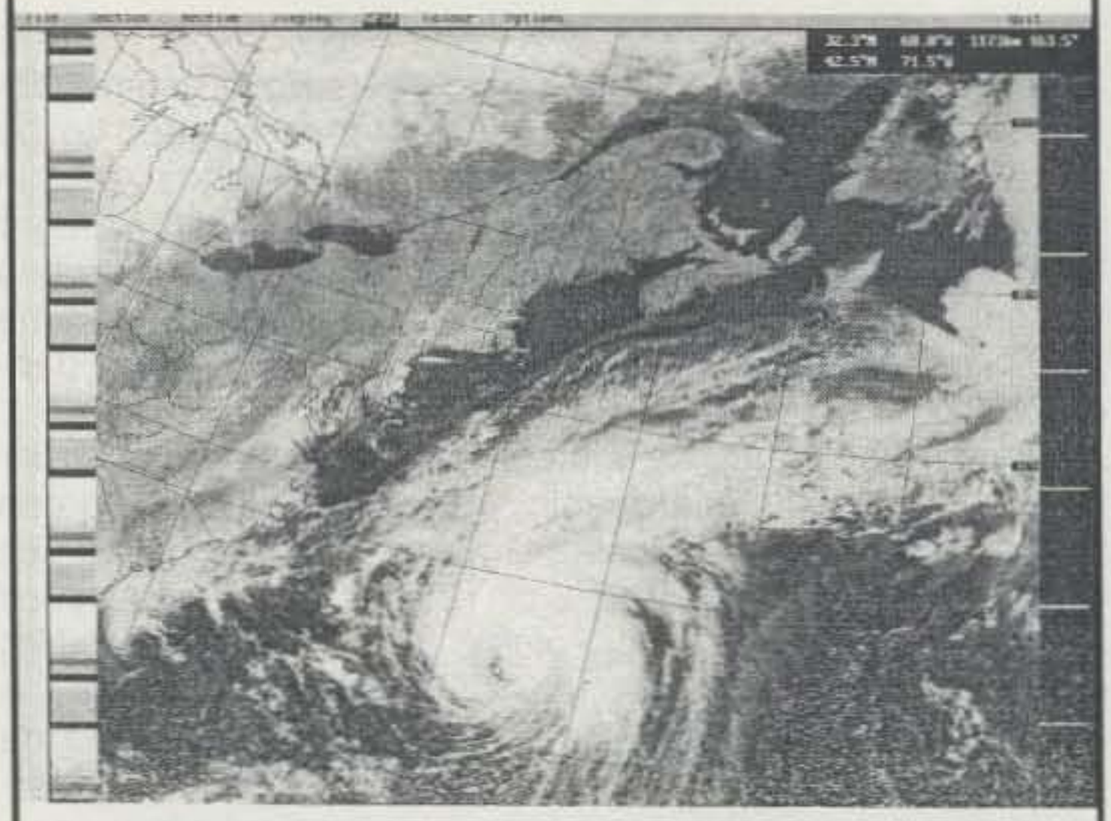

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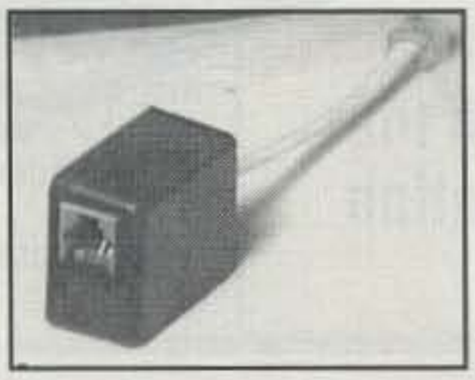

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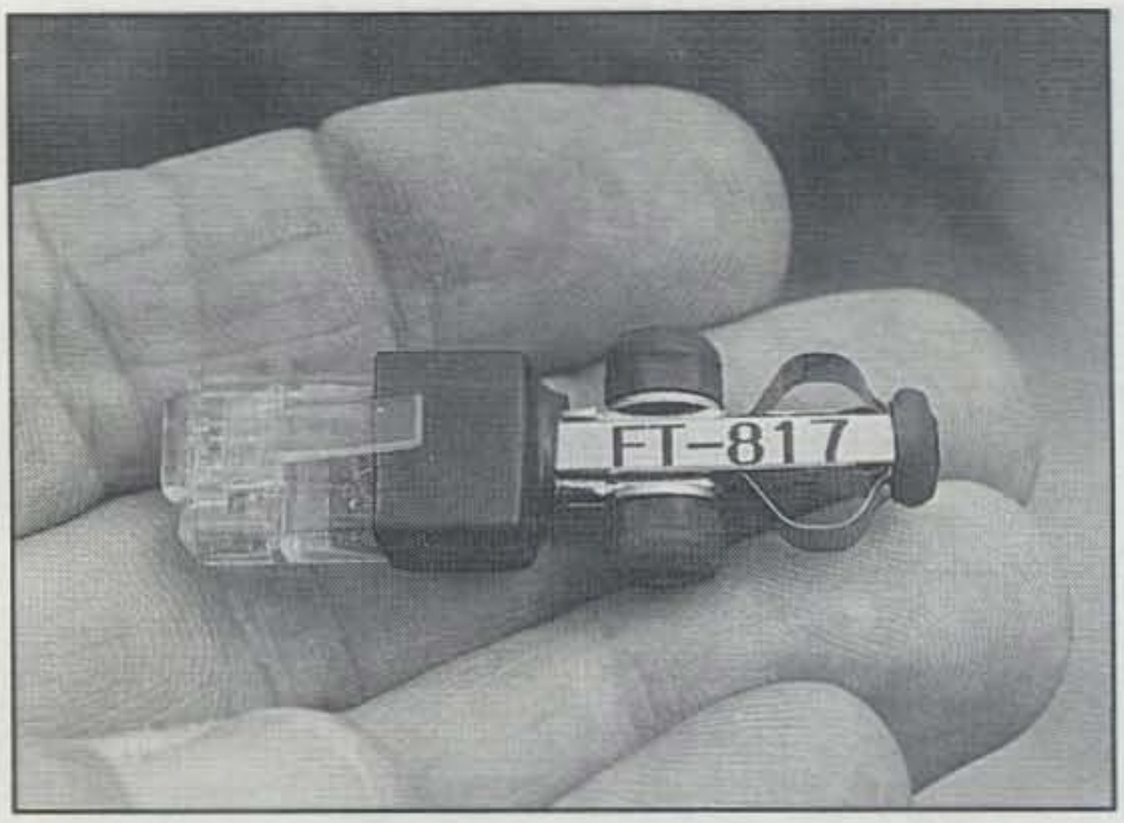


If "small" isn't small enough for you, check out this set of keyer paddles built right into an RJ-45 modular plug. (See text for details.)

NiMH pack works great without any adverse charging problems, no need to cut the green wire, and no memory effect that one might encounter with traditional NiCd batteries.

I also tested NiMH battery charging on the 8 hour and 10 hour menu item #11 selections, and the 10 hour charge took individual Maha AA cells from cold to mildly warm, but the new sealed Maha pack barely got warm. My advice would be to select the 6 hour charge period if you don't pull the batteries all the way down. However, if you should, it might take the 8 hour or 10 hour selectable menu time to bring them back up to a full head of steam.

Other Accessories

Okay, we've covered getting power into the FT-817 and getting a signal out. What about getting your message in? For voice, the Heil headset mic is small and offers great audio. For CW, you can go "small" with Bull Dog paddles made from a fastener and two buttons on a wooden base, or you can go "incredibly tiny" with a paddle built onto an RJ-45 modular plug by Dennis Foster, KK5PY. It keys the rig using the up/down contacts in the mic plug, and is available in the US for $25 + $3.50 shipping from Dennis Foster, KK5PY, 300 N. Maple, Commerce, OK 74339; e-mail <kk5py @rectec.net>. *(This is the paddle I mentioned in my August "Hot Stuff at Hamvention™" article that I saw but couldn't identify.—W2VU)*

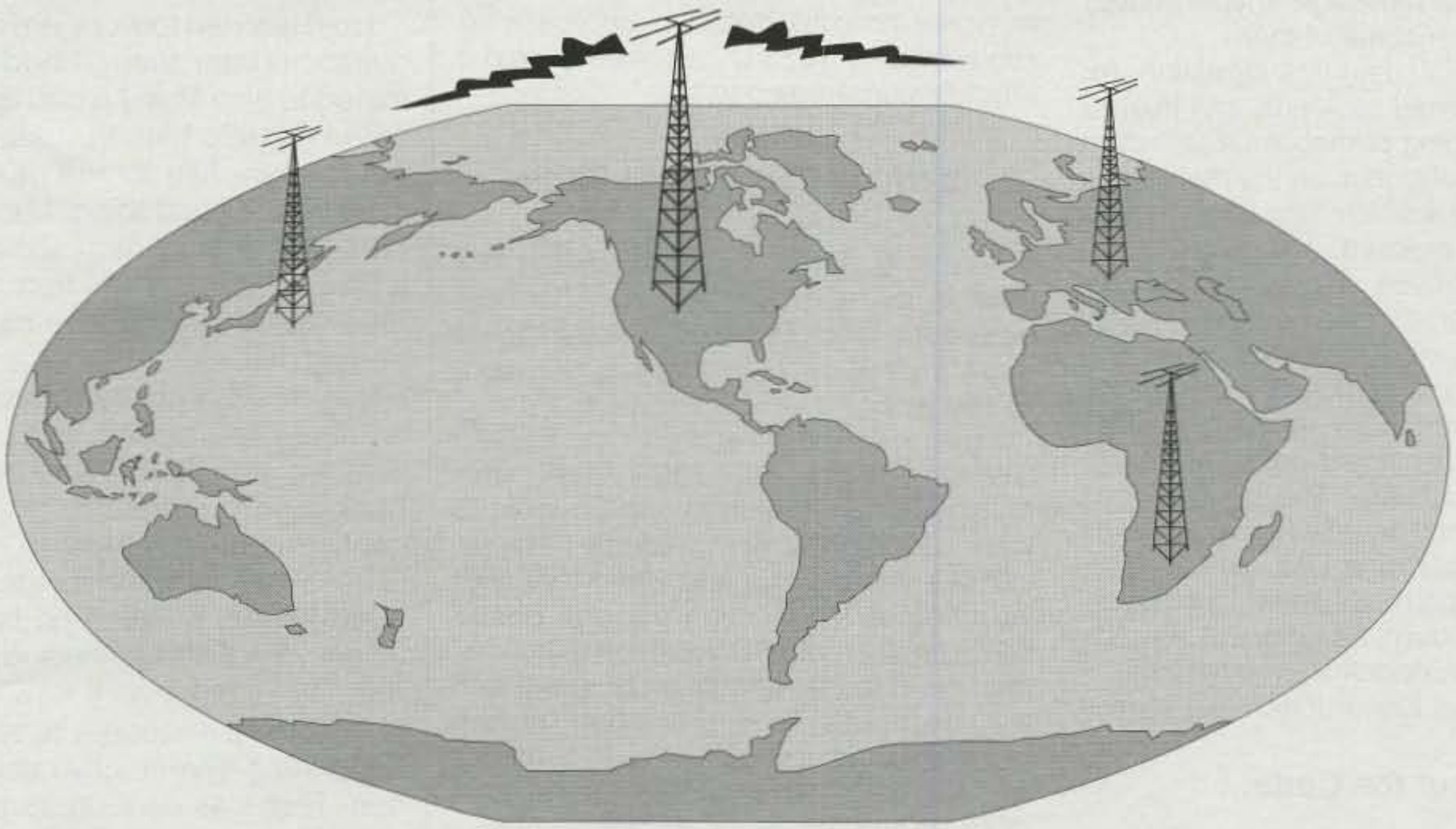
In addition, MFJ has brought out several new items aimed at the portable HF market, including a ground-coupled portable antenna base for temporary installation of vertical antennas; a 33 foot telescoping fiberglass mast that collapses to less than four feet; the "Travel Paddle" keyer paddle for portable use (or if your rig doesn't have its own keyer, a "pocket keyer" that comes with the Travel Paddle attached to the top). More details on these products appear in W2VU's "Hot Stuff at Hamvention" article in August *CQ*.

Hit the Trail!

If you're thinking of going portable, or lightweight mobile, there are plenty of accessories to match your new "anywhere" operation. Check out these products and see for yourself how manufacturers are really working into the excitement of portable/mobile high-frequency ham radio. ■

If you think you can't work real DX on 6 meters, think again. All it takes is the right part of the sunspot cycle (like now, for instance) and a lot of perseverance.

A Tale of Three Continents



BY BILL WAGEMAN,* K5MAT

Six meters is a wonderful band. You can listen for days, weeks, or even months without ever hearing anyone out of your local area, and then poof! The band opens up to who knows where. Of course, the band opens more frequently if you are well-equipped with plenty of power, a sensitive receiver, and a large antenna than it does if you are the guy with 10 watts, a relatively insensitive receiver, and a homebrew 4-element beam. The latter description applied to my station back in the late '70s and early '80s, and still does, except I now have a good pre-amp ahead of the old Yaesu FT-620B that has served me so well for more than 20 years.

Much of the attraction of 6 meters is the propagation mode called sporadic-*E*, or E_S. When E_S is in, one can work out to several hundred miles with quite low power and a simple dipole or vertical antenna. FM can be used to work all around the country at times, but the capture effect can make it difficult to carry on a good contact because different stations can "capture" the frequency at different times, sometimes holding the frequency for only a few seconds at a time. My Yaesu doesn't have FM, so I'll be talking here only about SSB and CW.

I never had any hope of working any *real* DX on 6 with such a modest station, but it was still fun to join in the pile-ups to see if I could crack them. I lived in Los Alamos back then and had the advantage of an excellent location. Once in a while my patience and luck would come through and I would actually work some of those folks in the northeast part of the United States, Alaska, and Hawaii, and even South America, but more often than not the band would go out before the pile-up became small enough for me to be able to get through.

I was first licensed in 1950 as a class B operator, and my college days brought with them almost no money to spend on ham radio. Thus, I had to be satisfied with 5 watts of CW using a homebrew transmitter and receiver with a 40 meter folded dipole up as high as 20 feet. Forty was much less crowded back then than it is now, and occasionally I was able to work some fairly exotic DX by being patient. As my operating skills progressed, I had more and more success, although I can't honestly say I was very good at it. However, some of the lessons I learned turned out to be useful for working DX on 6!

Fast forward to the 17th of November 1979 and 6 meters. I had already worked a couple of stations in Alaska a few days earlier, but it was quite a struggle. However, on the 17th I had a ball working AL7C, WL7ACY, KL7JAI, WB4WXE/KL7 (twice), and KL7CDG. A highlight was breaking in on a contact between an Alaska station and a friend of mine, Larry, WBØECV, who lived in Grand Junction, Colorado at that time. It was Larry I wanted, not the KL7! Larry was about S5 on SSB and the Alaskans were S9+, and I figured the only way I would get him was to interrupt their QSO.

The next morning my beam was still on Alaska, and I decided to call CQ on CW on 50.099. I had not heard anyone at all up to that time, and of course I did not expect to get an answer, except maybe from a local. When I finished the CQ, this extremely weak, but very stable signal was answering me. When he

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Our Readers Say

]Proposal for Manufacturers

Editor, *CQ:*

As ham equipment manufacturers' websites do not (unfortunately) contain any links entitled "suggestions" or "write to us," maybe a message in your magazine could reach some of them.

One VEEERY useful suggestion for mobile rigs to avoid accidents and frustration during logging of mobile QSOs when driving: Add pushbutton on the mobile mic to activate digital voice/data memory into the rig. When pressed, it should register transmitted/received voice info (like callsign, report, name), plus date/time, band/frequency, and mode as displayed during the QSO. When played back, voice recordings should be heard and the display should show associated date/time, band/frequency, and mode. The operator can write his log later manually or output all data over the CAT port and just add callsigns, names, and reports. Besides, I am astonished that modern rigs do not already include real-time clock with date/time!

Radi Kar, F6GNZ *(via e-mail)*

About the Code...

Editor, *CQ:*

Please do not stop Morse code on the amateur bands. If so it will be like CB radio and you know what that's like. Five wpm is a good speed to learn. I'm handicapped and I've learned the 5 wpm class and upgraded to General. I have a handicap license. I have gotten a waiver from the FCC application 610 form when they had it. Anyone can learn 5 wpm. It's easy. If I could do it, so can anyone else. However, if they remove Morse code from the hobby, that will be the end of ham radio, and then they will try to find a way to do away with the license classes all together because they want to popularize the hobby so that all may use the bands. I see the future of ham radio no more. They will, in time, get rid of the license class and license structure and that will be the end of the beautiful hobby.

73, Paul *(no last name or callsign given)*

Paul – No one we've encountered is suggesting the elimination of Morse code from the ham bands. What is being discussed – and appears likely to happen – is the elimination of Morse code testing as an international requirement for an amateur license with HF privileges. The International Amateur Radio Union (IARU) is now on record as believing that "the Morse code continues to be an effective and efficient mode of communication used by many thousands of radio amateurs, but ... the position of Morse as a qualifying criterion for an HF amateur license is no longer relevant to the healthy future of amateur radio..." (Last month's "Washington Readout" and "Zero Bias" covered the subject in detail.) Even if the international requirement is eliminated, it will still be up to each nation's government to make its own decision on licensing requirements. Russia has already said it intends to keep a code test.

Internet "Radio" Isn't Radio

Editor, *CQ:*

I know that this is a late response to a letter in the August issue, but I had just picked the issue up and felt like I should throw my two cents in. Great publication, by the way!

This letter is in response to "Defend SWLing," August issue 2001. First I'll start by stating my opinion about the topic of web "radio." Who ever had the nerve to call streaming audio and video files sent via internet (connection through phone line or cable) *radio*? This person either has their head too far into their computer and was desperate for a promotion, or has never touched or seen a radio in his or her life. There is nothing radio about web radio. When someone mentions "radio," huge towers pumping many kilowatts of power to a large group of satisfied customers comes to mind, or many individual radio operators trying to make that long distance contact! With radio you are capable of doing many things while listening to your favorite program or music, but with the internet you are forced to look at some screen and waste valuable time while receiving the same information. I don't know about the rest of the operators, but I like to talk on or listen to my radio and accomplish other tasks at the same time rather than playing on the net—not to mention appreciate what RADIO really is!

I agree with what Tim had to say about the international stations taking matters to the web and I think he has a strong argument. It's sad to see the international SW broadcasters are closing their doors to their AM operations and opening the digital doors. Since the head men of these international stations "act" (there's no acting about it) like they don't care about the opinion of their once cherished audience, why don't we (the listeners and other radio enthusiasts alike) join together and refuse to log on to their websites. Maybe the absence of web viewing will open their eyes to see how important RADIO (you know, a transmitter hooked up to an outside antenna targeting its listeners) is, not only to N. America, but to the rest of the world as well! Thank you for your time.

Jason, SWLer and radio enthusiast

gave his call as JA8JL, I became quite excited at first, but then I realized it couldn't really be anyone in Japan because the signal was too steady. Before he sent a *K* telling me to go ahead, I figured out that it was my friend Marty, WB5CNZ (now KR5YX), about 50 miles away in Albuquerque, who undoubtedly had his beam pointed in such a way as to give me this weak, steady signal.

I had learned to work 'em first and ask questions later, though, and I was determined to give Marty a bad time the next time I ran into him. Fortunately for me, I didn't hear him for the next few days. That was a good thing, because about four days later an airmail envelope with a QSL card in it came from JA8JL, and also included in the envelope were enough IRCs (International Reply Coupons) to send my card back to him by airmail! I felt foolish, but elated. That was the only time I have ever heard a station on 6 meters from Asia. It was continent number four.

Less than 24 hours later I heard a huge pile-up building on back-scatter, all working EI2W in Ireland. I could not hear him, but every now and then I checked the frequency to see what was happening. Eventually I began to copy him. That was exciting, but he was extremely weak at my location and was giving out reports of 59 on SSB, so I knew I had no chance at that time. I persevered listening, and soon realized he was working stations that were getting closer to me all the time, and likewise he was getting louder. When he worked his first station in Colorado, I started calling him on CW and worked him on about the third or fourth call. Back then there were only two stations active on 6 meters from Europe, and that was the only European I have heard on 6. Wow! Continent number five!

Almost exactly two years later, a similar thing happened with C5AEH in The Gambia, except I had to do a lot more calling before he picked me up through the pile-up. Jimmy, W6JKV, was running high power there, and I had added a good pre-amp ahead of my receiver. If I had realized that earlier, I could have saved a lot of time calling. That was the first and last time Africa was heard at my station on 6 meters. It actually took me nearly an hour to get through, but I'll never forget working the last continent for WAC (Worked All Continents) with my 10 watts and 4-element beam.

Sometimes things that seem completely beyond reach can be accomplished with a little bit—or maybe a great deal—of luck. Have fun on the magic band! ■

Visit Our Web Site

Reader Survey February 2002

We'd like to know more about you—about who you are, where you live, what kind(s) of work you do, and of course, what kinds of amateur radio activities you enjoy. Why? To help us serve you better.

Each time we run one of these surveys, we'll ask a few different questions and ask you to indicate your answers by circling numbers on the Reader Service Card and returning it to us. As a bit of an incentive, we'll pick one respondent each month and give that person a complimentary one-year subscription (or subscription extension) to *CQ*.

As outlined in this month's "Zero Bias," we'd like your input on the concept of occasionally including articles in *CQ* that do not have a direct connection to amateur radio.

Please indicate...	**Circle Survey Card #**
1. the level of your interest in science and technology beyond the "borders" of amateur radio.	
Intensely interested	34
Very interested	35
Somewhat interested	36
Not very interested	37
Not at all interested	38
2. whether you currently subscribe to or regularly read other magazines covering science and technology outside amateur radio:	
Professional journal(s):	
Subscribe	39
Read regularly	40
Read occasionally	41
Do not read	42
Trade magazine(s), such as *PC magazine, PC Week,* etc.:	
Subscribe	43
Read regularly	44
Read occasionally	45
Do not read	46
Consumer magazine(s), such as *Scientific American, National Geographic,* etc.	
Subscribe	47
Read regularly	48
Read occasionally	49
Do not read	50
3. whether you think *CQ* should occasionally devote space to information about science and technology that is not directly related to amateur radio.	
Yes	51
No	52
Don't know/no opinion	53
4. if *CQ* does occasionally devote space to such non-ham information, whether it should be:	
Occasional feature articles	54
Regular "roundup" column	55
Worked into existing columns	56
CQ should not do this	57
5. whether the occasional inclusion of information not directly related to amateur radio will influence you to:	
Renew my subscription / buy *CQ* more often	58
NOT renew my subscription / stop buying *CQ*	59
No change in my *CQ* subscription / reading habits	60

Thank you for your responses. We'll have more questions for you in our next reader survey.

What You've Told Us...

Our October survey asked about your mobile operating activity. In a pattern that we're seeing quite often when we ask about specialized activity, it was mostly the people who are active in that activity who respond. Still, it provides us with a good picture of what's important to this particular group of active hams.

Among the group of readers who responded to the survey, 88% say they currently operate their ham stations mobile. This contrasts with the approximately 40% of readers who regularly check off "mobile" operating in the demographic portion of our survey card.

Of the mobile operators, 48% operate exclusively VHF/UHF while in their cars, while 36% operate HF in addition to VHF/UHF, and 5% operate only HF from their vehicles.

FM is the most popular mobile mode, favored by 78%, followed by SSB (45%), CW (9%), digital (3%), other (2%), and amateur TV (1%). What are you driving? A majority (53%) operate from an automobile, while 48% have rigs installed in a light truck, van, or sport utility vehicle. Number 3 on this list was "on foot" (16%), followed by RV/trailer/camper (11%), bicycle (7%), boat (4%), a tie at 3% between motorcycle and "other," and another tie at 2% between heavy trucks and airplanes.

Most of you operate primarily while driving (74%) as opposed to while being a passenger (6%), and another 20% operate mostly while stopped in some location away from home. The vast majority of you use your rigs on the road either while traveling (41%) or commuting (35%), while only 7% do most of their mobile operating while on trips made specifically for a ham radio purpose, such as giving out counties or operating as a "rover" during VHF contests. Finally, ragchewing is the most popular mobile activity, followed by DXing and contesting.

As always, thank you to all who responded to our survey. This month's winner of a free one-year subscription to *CQ* is David Chase, KGØYR, of Gravois Mills, Missouri.

Public Service

BY BOB JOSUWEIT, WA3PZO

Public Service and Emergency Communications

Homeland Security: Will You Be Ready if Needed?

Last November President George Bush called for a volunteer civil defense service which would help police and fire departments, as well as public health agencies, in times of emergency. President Bush said participants in The White House envisioned using 20,000 or more volunteers this year to perform routine tasks so that emergency workers can pursue more urgent duties. Amateur radio operators have a long history of helping their local civil defense and emergency management agencies. Since 1952 the Radio Amateur Civil Emergency Service (RACES) has provided communications personnel to government agencies in times of need.

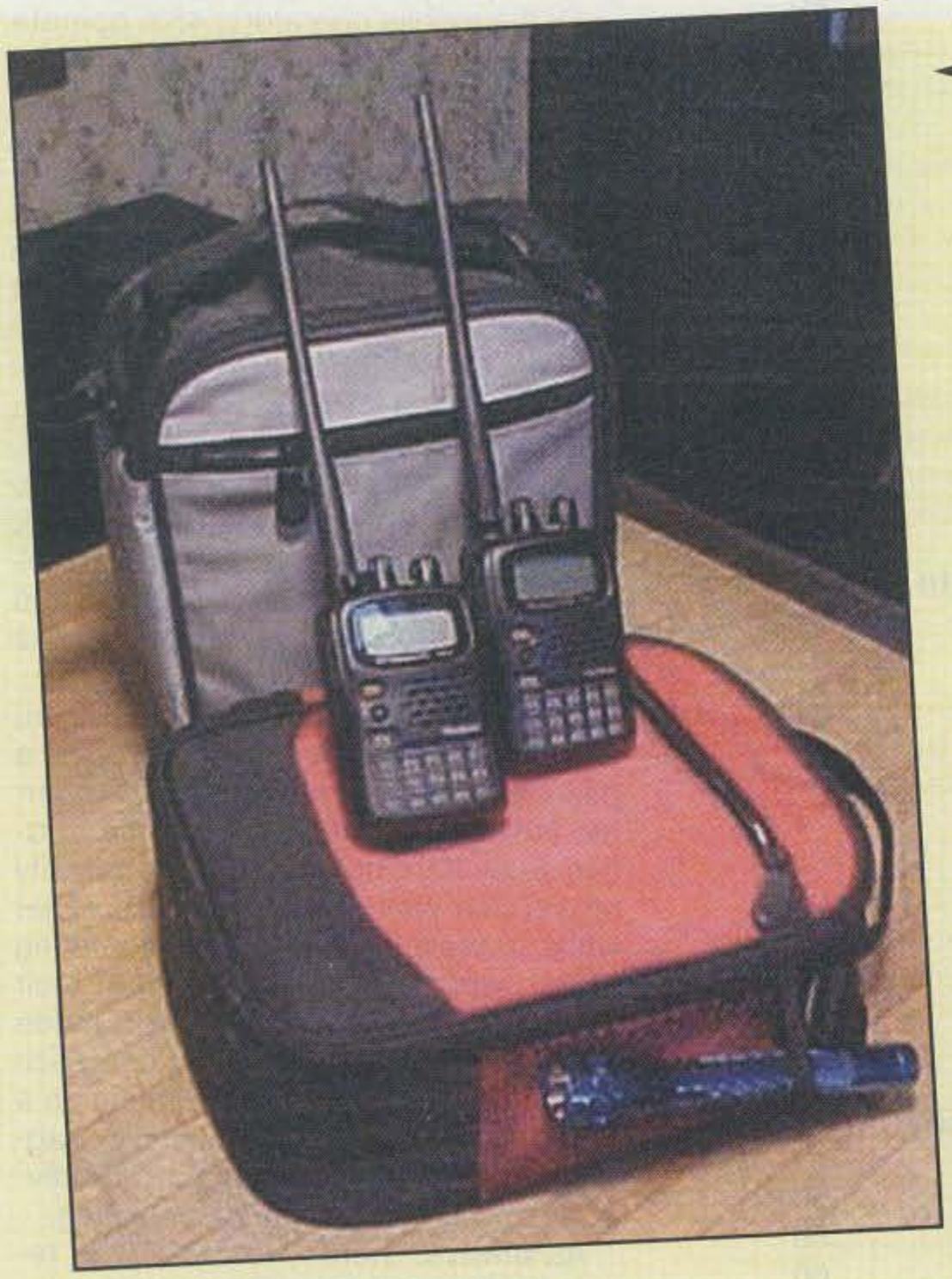
c/o CQ magazine
e-mail: <wa3pzo@cq-amateur-radio.com>

Also last November the Federal Communications Commission formed a Homeland Security Policy Council. The council will assist the FCC in evaluating and strengthening measures for protecting U.S. communications services. In addition, it will assist the FCC in ensuring rapid restoration of communications services and facilities that may have been disrupted as the result of threats to, or actions against, our nation's homeland security. It also will ensure that public safety, health, and other emergency and defense personnel have effective communications available to them to assist the public as needed.

A Need to Be Prepared

For years many amateur radio operators have prided themselves on being ready at a moment's notice, whether it's a severe storm cell, a traffic accident, or the events of September 11th. Fairfax County, Virginia ARES Assistant Emergency Coordinator C. Edward Harris, KE4SKY, said, "It is better to have the bare essentials always handy than to leave a bulky pack someplace where you can't get to it."

As amateurs responded to the World Trade Center disaster they were required to carry their stations on their backs. In many cases they could not drive to the disaster. They had to walk in and report for duty. Steve Merrill, KB1DIG, and Kim Merrill, KB1GTR, traveled to New York to helped provide logistical communications with members of the Salvation Army Team Emergency Response Network (SATERN). Both are active with the New Hampshire



Color-coded bags may help separate radio gear and personal items. (Photo via Steve, KB1DIG, and Kim, KB1GTR)

Having small items neatly arranged makes them easy to find in case of emergency. (Photo courtesy Steve, KB1DIG, and Kim, KB1GTR)

Amateur Radio Emergency Service. They determined there was a need to expand their capability for emergencies on a daily basis. Their basic question was "How do we get all this HT equipment out of the drawer and into our hands when we need it?" The answer is a "Go-Kit."

Go-Kits

A Go-Kit is a collection of stuff that would allow you to be able to meet your basic needs and get a station on the air for a given period of time. There may not be a perfect Go-Kit. Some of the items in the kit may vary based on your location and specific requirements. See the sidebar for a list of items that could be stored in the car in case you are asked to respond to an emergency. Some may want to empty out their entire shack like they do for Field Day, but that just isn't practical on a daily basis. The key is to be flexible. Does the list match yours?

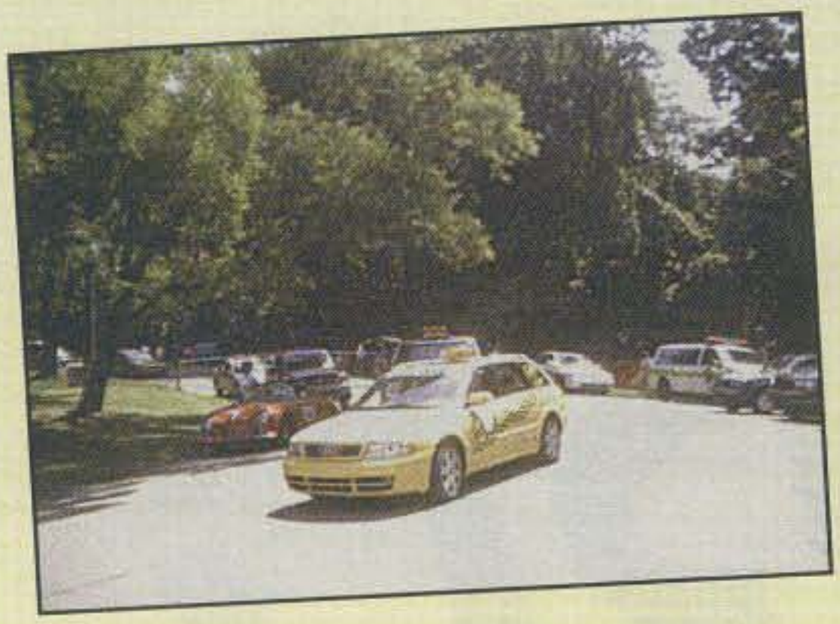
After you decide what you want to carry, you then need something to put it in. Fanny packs, camera bags, or soft lunch boxes all work well. If you are planning on using different bags for different situations, then you might want to color code the bags. Consider plastic bags to keep the rain off items or bubble wrap to help protect radios and other equipment. All of the equipment should be labeled.

As we said before, having the basics with you is better than having nothing at all. Did we leave something out of the list? Check out Steve and Kim's website at <http://people.ne.mediaone.net/buck0/hamgear.htm>) and see what ideas they came up with and what you might want to add to your Go-Kit.

Have Fun—Providing a Service!

Start your engines! You might envision a modern auto race. However, Pittsburgh, Pennsylvania is known to go back in time a bit for its annual Pittsburgh Vintage Grand Prix (PVGP). A city park near the University of Pittsburgh and Carnegie-Mellon University is shut down and the fun begins over a 2.33 mile course winding around five 180-degree turns, nine other turns, and a quarter-mile straight away that ends in a chicane *(a movable barrier used in motor racing—ed.)*.

The race is a two day event with practice on Saturday, time trials Sunday morning, and racing in the afternoon. There are usually six races of ten laps each that take about five hours. The



Corner 18 draws several emergency workers, since some vehicles come through the turn at 80 mph. It's also a critical spot for amateur radio communications in case of trouble. (Photo via WN3VAW)

Bryan Beyer, K3OL (far right), alongside Corner Captain John Corpin. The primary job of the radio op is to relay information to the Corner Captain and from Able (Net and Race Control) via the 2 meter simplex net. (Photo via WN3VAW)

Vintage cars rely on amateur radio communications as they make their way through Pittsburgh. (Photo courtesy Ron, WN3VAW)

race runs in all conditions, from rainstorms to burning-hot dry days. And there is no charge to the public.

There are over 350 volunteers on the course manning 14 flag and another eight corner stations. Amateur radio has been involved with the PVGP since its very start. For the 19th annual event a local ham radio store actually lent HTs to hams who needed them. According to Ron Notarius, WN3VAW, at least 75 to 80 hams from 24 western Pennsylvania clubs join efforts for the annual event.

"Our primary purpose is to provide race-course communications," said Notarius. He explained that there is at least one ham at every corner and flag station, and at least one assigned to every on-course non-city safety vehicle, which includes "the rope tows and wreckers that go out and get cars and some of the other PVGP 'official' vehicles." City regulations preclude any ham from being on board city paramedic, police, or fire vehicles. The hams provide communications between the Corner Captains, who run each corner, and "Able," the Race Control.

The Corner Captains are in charge of the people with flags, or "flaggers," and security at each corner. Security personnel keep the public out of the restricted race area for safety reasons. They also chase away all of the joggers who ignore the "park closed" signs. The flaggers use colored flags similar to semaphore flags to signal the drivers as to course conditions. The flags tell the drivers to slow down, there is debris on the track, or that they are being passed. Sometimes the message is that the car should head for the pit or the race has been stopped. Notarius said, "When there is a problem of some kind, the Corner Captain tells the ham to call it in, and then Able tells everyone else how to handle it."

The information relayed via ham radio is important. Notarius explained a typi-

The Go-Kit

Radio-Related Items
- 2 meter or dual-band HT
- HT's operating manual (When was the last time you programmed yours?)
- Speaker/microphone
- Earphone
- High-gain dual-band antenna for 2 m/70 cm use
- Extra high-capacity battery pack
- Battery charger (supplied with HT)
- Rapid charger attachment to battery charger
- Cigarette lighter cord
- Alkaline battery pack (in case there is no electricity)
- Two extra 3A fuses, for cigarette lighter cord
- Coax connectors and adapters UHF to BNC, BNC to UHF, BNC to SMA
- Roll-up J-pole with about 10 feet of coax; great for semi-permanent base-station applications.
- A suction cup or other temporary antenna.
- Electrical tape
- Small tool kit

Other Items
- Copy of amateur radio license
- Small flashlight
- Two Ink pens and two pencils
- Paper/notepad
- Emergency gas/phone money (bills and change)
- Medicine(s)
- Hard candy/granola bars
- Band aids
- Surgical gloves
- Disposable lighter
- Small pocket compass
- Local ARES phone and frequency reference card
- Cable ties

Personal Items
- Current eye-glasses prescription
- Moist towelettes
- Operating quick reference card for HT
- Pocket sewing kit
- Aspirin/Tylenol®
- Antacid tablets
- Throat lozenges
- Whistle
- Family members emergency contact list
- State road map
- ID card (inquiring minds need to know)
- Pocket first-aid kit
- Hat
- Bug repellent
- Sun block
- Rain gear
- Snack food, trail mix, lunch, two pints of water
- Small pack of Kleenex ® tissues
- Poison-ivy lotion

cal communication that he might receive at his post at Corner 18, the top of a double hairpin right before the Start/ Finish line. "If they want to talk to a driver or have him pit for mechanical reasons (like the muffler fell off), Able will tell Corners 15–17 to let us know when that car (identified by color and number) is approaching so the flaggers have enough time and warning to signal that driver and display the pit flag. If we have a car go off course or stop on the side of the course between us and Corner 19 down below, we can have 17 wave a yellow (caution ahead) flag so that they know there's a problem coming . . .

"Corner 18 is one of the locations where the safety vehicles are stashed and where we have enough room to hold cars that have to pull off for any reason. (We've had a half dozen or more stashed at a time.) Many of the corners are behind walls and unable to do that. When someone pulls in, we tell Able who, why, and whether or not they can continue, or if they will need to be towed in at the end of the event."

In addition to the actual race communications, hams also provide communications between the Race Control and City Command posts. They also shadow various officials to provide instant communications. Packet radio is used to relay information from the Race Command to the announcers to keep the spectators informed. Several amateur television (ATV) units are stationed around the course. At the chicane, race officials are able to see what's happening as it happens.

"Some cars have gone airborne going through there, or picked up a traffic cone," said Notarius, "and loads of cars come out with more straw than the Wicked Witch had pulled out of the Scare Crow!"

The primary operating frequency is on 2 meter simplex. There is also a back-up frequency. A separate 2 meter simplex net is set up for the safety vehicles. By doing this, the amount of cross traffic is reduced. Finally, a "private" administrative net is set up on another band. As with any event, but particularly auto racing, there is the possibility of an accident, and that accident could be a serious one. Local amateurs have developed an emergency scenario called "Dr. Sparks." Notarius explained that when Dr. Sparks is heard on the radio, there is an order to maintain radio silence and shut off external speakers, which can be heard by the public.

The race organizers have come to appreciate the work of the ham radio operators. One of the original organiz-

TECH TALK

IC-PW1: No Pain, No Strain, But Plenty of Gain

THE CONTESTOR'S FULL GALLON HF + 6M AMP. Serious hams demand serious performance, even deep into the wee hours of a long contest. The IC-PW1 delivers, offering full duty performance while pushing a full gallon output on all HF bands and 6M! Credit the performance in part to the IC-PW1's large, one piece heat sink. Four PAs are bolted to the sink, all cooled by no less than three thermostatically controlled fans. Two more fans – one for the tuner and one for the power supply, also help keep things cool under contesting pressure. (The tuner fan comes on whenever transmitting, the power supply fan runs continuously.) Yet the footprint of this compact wonder is small enough to sit right next to a desktop contesting station. For even more desktop savings, remote the control head and move the main unit under the desk, out of the way. Your 1 KW station leaves plenty of room for your computer and other essential station equipment!

ICOM IC-PW1(Control head mounted)

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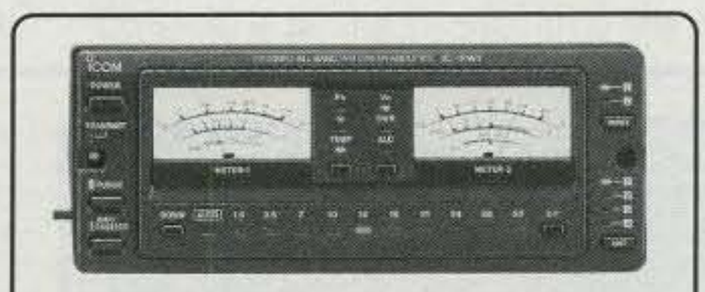

The IC-PW1 remote control head

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Many times hams show up at various public service events and get little or no acknowledgement that they are at the event, let alone noticed for the important work they are doing. Here's an example of an article on amateur radio that appeared in the PVGP Program Guide. The article was written by a ham and submitted to the race committee for publication.

Vintage Wireless Connection

You might be wondering how people get their information about where the cars are located, or how the corner workers know which flags to show around the track. Well, the answer is *amateurs,* or more correctly, the Amateur Radio Service. These operators are members of the National Traffic System, the American Radio Relay League, and other local and national organizations.

While working the Pittsburgh Vintage Grand Prix is one of our more recent operational services, amateurs, or "hams," have been around and helping out since about 1900. The 100-plus amateurs who work the Grand Prix are only a few who participate in events locally and worldwide. You'll see them at the Pittsburgh Marathon, the Thrift Drug Bike Classic, the MS Walkathon, and the various air shows which depend on amateurs being part of the team.

Amateurs also help with news and weather information gathering, act as storm chasers, aid relief efforts in time of disasters, and send out goodwill messages. Why, there are even amateurs in the military.

The amateur communications spectrum varies from broadcasting to satellite communications, from radio teletype and the internet to good old Morse Code. You'll even find them on television. They have helped for some time now to make many of today's technical advances possible.

So when you see these folks working their stations around the course, providing race communications, radar for timing, sending ATV pictures back to Race Control, keeping you aware of the weather here at the race, or offering health and welfare messaging for the guests and volunteers, ask them about their work. They'll be glad to tell you about their long tradition of "being there." Who knows? You may discover you'd like to enjoy the art and experimentation yourself.

ers of the event, Barry Kaplan, finally got licensed last summer. Barry now sports the call KB3GKT.

Let the Games Begin

Utah hams are busy assisting local officials for this year's Winter Olympics. They have been registered since October. They have participated in drills and exercises, and now it's time for the games to begin. As the games commence we can look back at the 1980 Winter Olympics in Lake Placid. Those may have been the first Olympics where ham radio operators were awarded an Olympic Medal. Ham radio operators supplied primary communications for the Olympic Torch Relay, which went from Yorktown, Virginia to Lake Placid, New York over a 10 day, 1000 mile run. The Olympic Appreciation Medal is the same as a bronze medal except that it is not won in competition. At the time, hams provided critical logistical communications as the torch bearer entered towns and ceremonial sites.

Do You Have a Story to Tell?

This month we would like to thank Steve, KB1DIG, and Kim, KB1GTR, and Ron, WN3VAW, for supplying information for the column.

Do you have a story to tell? We want to hear from you. Send your reports to <wa3pzo@cq-amateur-radio.com>. Until next time. 73, Bob, WA3PZO

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POPULAR COMMUNICATIONS

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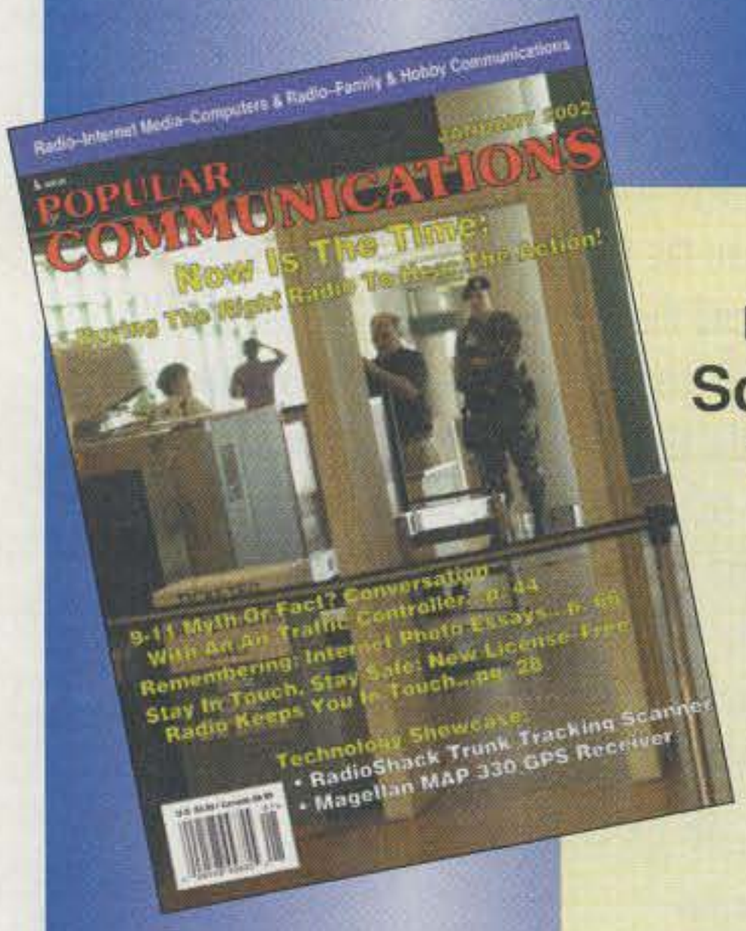

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Ameritron's active electronic *true* peak reading meter accurately reads forward and reflected power and SWR *simultaneously* on a lighted Cross-Needle meter.

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Roomy extra-strong .080 inch thick aluminum cabinet gives highest efficiency and lowest loss. 13¼Wx5⅝Hx17½D inches.

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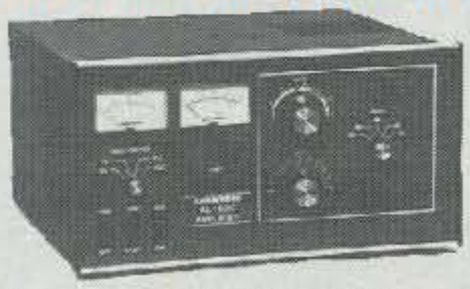
ATR-20, $459. Handles full 1.2 kW SSB/600 Watts CW. Handles full SSB power of Ameritron AL-811/811H/80B/ALS-500M/600, other 1.2 kW SSB amps. Roller inductor, turns counter, verniers on capacitors, balun, cross-needle SWR/Wattmeter.

Ameritron has the best selection of *TrueLegalLimit*™ HF Amplifiers

AMERITRON's legal limit amplifiers use Peter Dahl super heavy duty Hypersil power transformer capable of 2500 Watts!

Ameritron's *most powerful* Amp

with Eimac® 8877 ceramic tube



AL-1500

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Suggested Retail

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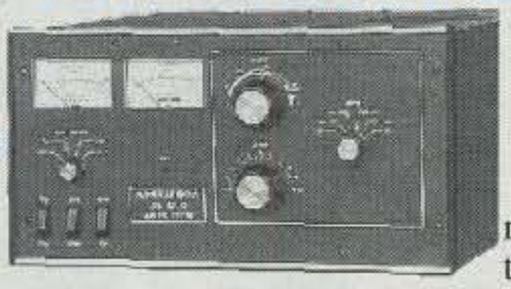
Ameritron's *most powerful* amplifier uses the herculean Eimac® 8877 ceramic tube. It's so powerful that 65 Watts drive gives you the full output power -- and it's just loafing because the power supply is capable of 2500 Watts PEP. All HF bands, all modes. 77 pounds, 18½Dx17Wx10H in.

Ameritron's *toughest* Amp

with Eimac® 3CX1200A7 tube



AL-1200

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Get ham radio's *toughest* tube with AL-1200. The Eimac® 3CX1200A7 has a 50 Watt control grid dissipation and the lowest history of field replacement of any modern transmitting tube that we use. 90 Watts in gives you full power out. All HF bands, all modes. 76 pounds, 18½Dx17Wx10H in.

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with 2 graphite plate Amperex® 3-500ZG tubes

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1.5 *plus* kW SSB HF Amp

with 2 Eimac® 3CX800A7 tubes

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with four Svetlana® 572B tubes

AL-572, $1395 suggested retail. New class of *Near Legal Limit*™ amplifier gives you 1300 Watts SSB PEP power output (70 Watts drive) for 65% of price of full legal limit amps! Instant 3-second warm-up. 40 lbs. 8½Hx15½Dx14½W inches.

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World Of Ideas

BY DAVE INGRAM, K4TWJ

A Look At The World Around Us

Survival Radio Challenge Update

Our survival radio challenge which ran from August 1 to December 15, 2001 plus the continuing threat of terrorism around our great country placed a noticeable emphasis on the need for "use anywhere" communications gear—so much so, in fact, that we are integrating a variety of ideas on emergency preparedness, alternate energy systems, and ultra-light HF'n into future columns. I am also busy writing a new book on the subject, and first copies should be printed slightly before the 2002 Dayton Hamvention®. In addition, we are considering kicking off a second, more defined survival radio challenge and would like to hear your opinion. We will discuss that idea in more detail near the end of the column.

In the meantime, we have some very interesting photos and information from a few entrants in our first "challenge" to share with you. The challenge was still in effect and papers from several more entrants were still due when this column was written. Final judging was slated for early January. A couple of keys specials will follow this column, so right now is the ideal time to preview the "survival scene." Let's begin with a look at how Patrick Tipton, KLØYO, "hams it up" in the cold back country of Alaska.

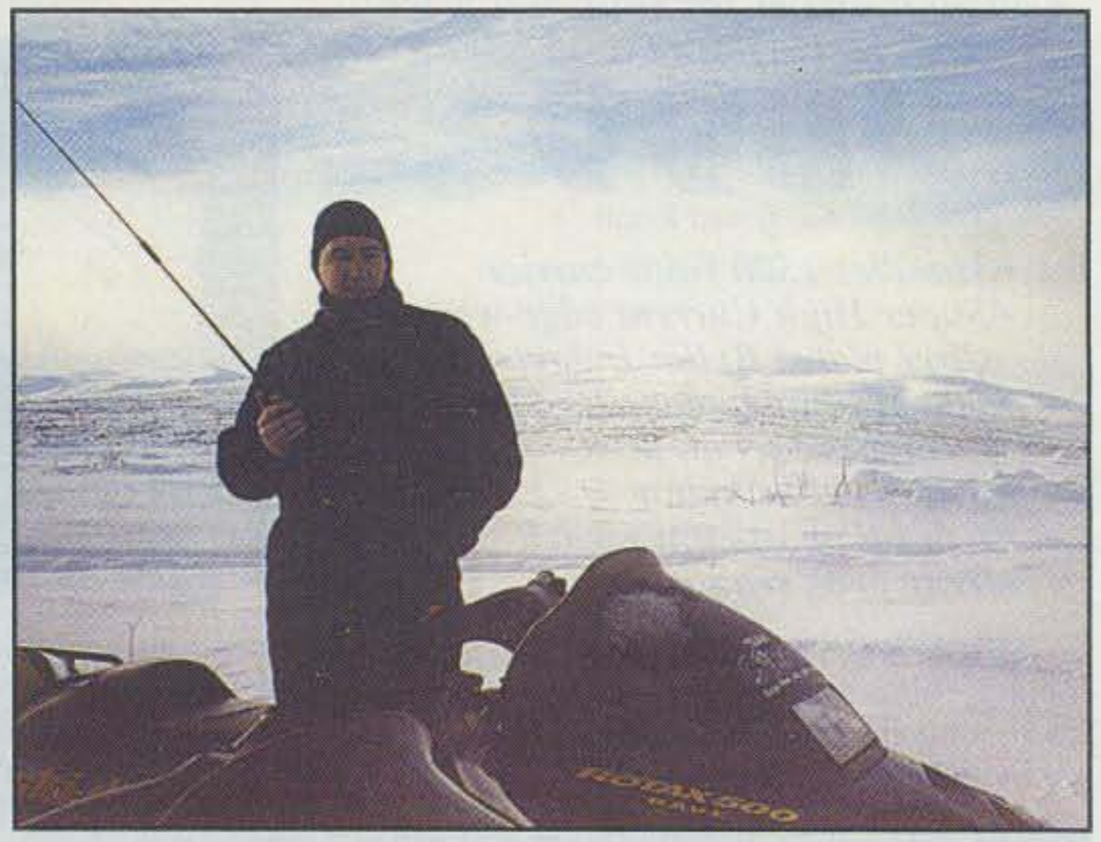

Photo 1– Patrick Tipton, KLØYO, travels the winter wonderland of remote Alaska on a snowmobile and relies heavily on amateur radio for communications with the "outside world." Here the ex-U.S. Army Paratrooper and Ranger is using a dual-band ICOM W-32 FM handheld with a Premier AL-800 pull-up gain antenna to check in with friends via UO-14, the FM repeating satellite. Amateurs anywhere on Earth with or without commercial power or large antennas can communicate through low-orbiting satellites such as UO-14. They are great for emergency preparedness.

Ham'n from the Fridge

From somewhere between lost and found comes views of the portable/survival setup Patrick Tipton, KLØYO, uses to stay in touch with civilization while traveling in Alaska (photos 1, 2, and 3). As Patrick explains, "The days are short and the nights are long up here, and most of the Alaskan back country does not have cell-phone coverage. That need for survival communications was one of the main reasons why I got involved with amateur radio. I started with an ICOM W-32 Dualbander and Premier AL-800 pull-up whip for working through LEO satellites such as UO-14 while snowmobiling (photo 1).

"Before embarking on trips, I gear up with a month's worth of satellite pass calculations courtesy of Big Dan, WL7BD, and coordinate with other UO-14 ops so someone will be listening for me if I need help. I also carry a portable Sony shortwave receiver for monitoring nightly news broadcasts from the Voice of America."

Jolly good show, Patrick! That's what we call using amateur radio (and OSCARs) effectively. Your views should also help make all readers aware of the importance of properly sharing our satellite resources. They are indeed a reliable and fully predictable communications medium amateurs of all lands can use during the good and not-so-good times.

Patrick recently added a new Yaesu/Vertex FT-817 plus a fine array of supporting accessories to his setup, and he is now snowmobiling in high style. He uses the FT-817 for working through UO-14, monitoring the international shortwave broadcast bands, general HF QSOing, and checking into the Alaskan Bush Net nightly on 7.093 MHz. Amateur radio

Photo 2– A peek inside the KLØYO travel pack reveals the main rig of a Yaesu FT-817, two 9.6 volt battery packs, AA battery case/tray, lithium cells for emergency use, power cables, mic, mini paddle, earbuds, and sports-type headband LED flashlight. Also included is a roll-up multiband dipole, ICOM W-32 dual-band talkie, and pull-up VHF/UHF antenna. (Photo via KLØYO)

4941 Scenic View Drive, Birmingham, AL 35210
e-mail: <k4twj@cq-amateur-radio.com>

Homebrew Classics Feedback

Response to our October and November 2001 "World of Ideas" columns featuring classic homebrew rigs has been overwhelming, and several readers also have added postscripts worthy of recognition.

First, Alvin Bernard, NI4Q, points out the 6AQ5 transmitter featured in our November column was originally designed and written up in the March 1956 issue of *Popular Electronics* by his friend and mentor Elton Stolberg, W7OUV.

Next, our good friend and designer of the Vibroplex Code Warrior, Code Mite, and Venus keys, Wayne Smith, K8FF, stepped up to say that same 6AQ5 "Sandwich Box Transmitter" was his first homebrew project in 1956. Wayne also recently homebrewed a magnificent in every detail reproduction of the transmitter and promised to send a photo for inclusion in a future column. Wow—6AQ5 rigs are as popular as 6L6 rigs!

Charles Dailey, KØEOD, pointed out the Knight DXer in our October column was vague on its ground-to-battery connection, and Bob Morden, VE3EIM, added plug-in coil numbers to the DXer. Combining both notes, the plate/tickler coil is Pin 1 at the top, Pin 2 at the bottom (Pin 5 of IS5), Pin 3 at the 2–30 pFd capacitor, and Pin 4 at the bottom (also the ground and negative connections of A and B batteries). Pin 4 of the IS5 connects to the tube's top/upper (suppressor) grid in the tube. Finally, Vic, W1NU, pointed out "Harass" featured in our November column was originally designed by Lew McCoy, W1ICP, and described in February 1966 *QST*. Thanks, guys!

serves more needs than entertainment for this chap. It is his main survival link with the outside world!

If we look closer at the backpack/mobile/portable setup of KLØYO (photos 2 and 3), a large number of lessons and ideas adaptable to our own survival radio plans come into focus. In addition to the W32 FM handheld and FT-817 transceiver, Pat also carries a GPS receiver for navigation, a pair of 9.6 volt 1400 maH NiMH battery packs, a Yaesu NiCad battery pack, and an AA battery case/tray for the FT-817 when traveling. A cigarette-lighter adapter/cord is used for recharging the battery packs from the snowmobile, and a flexible solar panel for "stand alone" recharging has been ordered. The idea of recharging batteries with solar power, incidentally, holds very high appeal in today's world. Remember it, and watch for a future "How It Works" column with details on the subject.

The previously mentioned 9.6 volt NiMH battery packs are available for $25 from RadioShack (item number 23-331B). They are flat packs of eight AA cells designed to fit RadioShack's "Turbo Racer" remote-controlled car, but they also fit right in an FT-817. The only hitch is their plug must be changed to fit the 817, and finding one (aside from special ordering it from Yaesu) is challenging. Of course, one could always homebrew a small adapter cable and leave the original Yaesu battery plug and socket intact.

Pat finds NiMH, NiCad, and alkaline battery packs plus LCD readouts "freeze up" at around –10 degrees or colder, so he fills the transceiver's battery tray with (expensive but very reliable) lithium cells for emergency use. He also packs a couple of disposable hand warmers with his gear to keep it warmish while traveling (Wal-Mart sells them under the brand name "Warm Hands.").

Also included in the KLØYO backpack is a roll-up multiband dipole with coax cable, earbud 'phones, mic, paddle, pocket atlas, sheets with satellite pass information, and various adapters/connectors. All of the previously men-

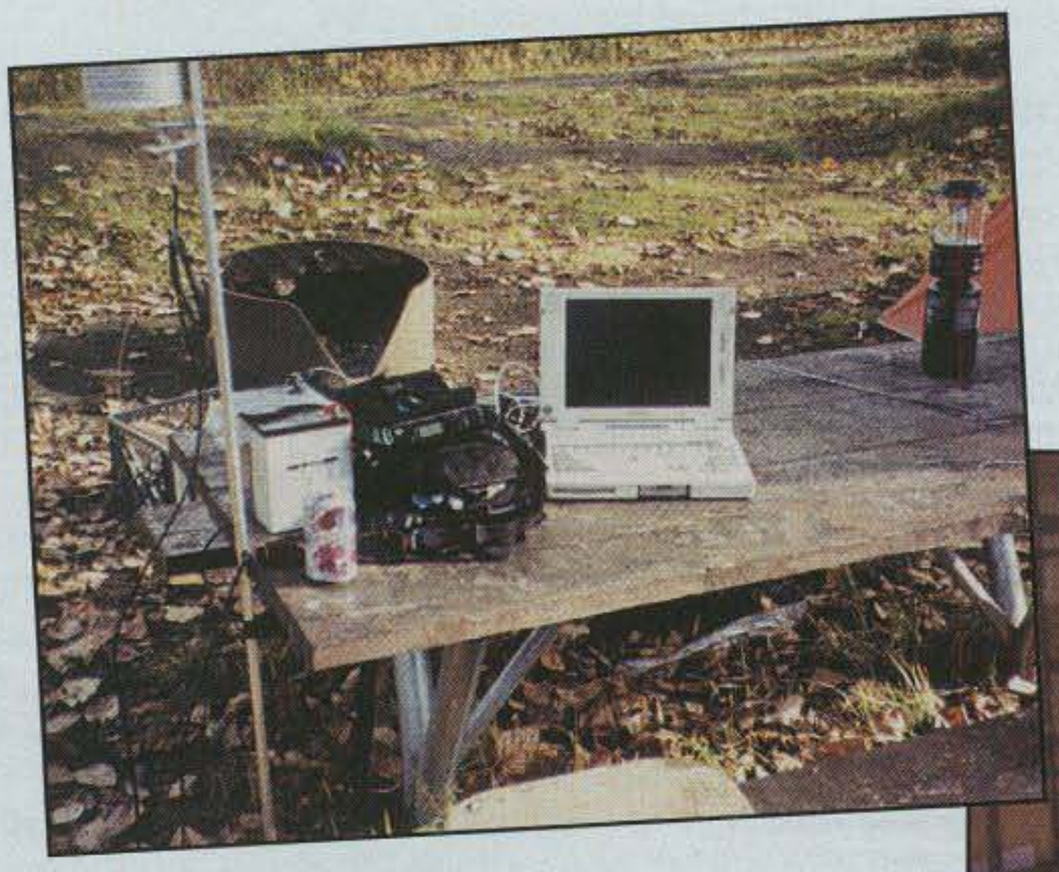

Photo 3– The KLØYO all-battery-powered camp setup. Equipment includes an FT-817 transceiver, laptop computer, "30 amps worth" of gel cells, a camping lantern, and a recently added snap-apart vertical. Setup is used for both pleasure and survival applications. (Photo via KLØYO)

Photo 4– Ham in a box! Bill Campanelli, W2LRU, combined several pieces of extra equipment to produce this go-anywhere station, and it is an economical way to address basic survival needs. Gear consists of an MFJ-9040 transceiver, MFJ-971 antenna tuner, keyer, AC supply, and homebrew tuner for balanced lines. Portable battery with internal charger and Hamstick antenna are used for impromptu on-the-spot operations. (Photo by W2LRU)

Photo 5– The W2LRU "box station" packed up and ready to travel. The fishing reel beside the box holds antenna wire. (Discussion in text.)

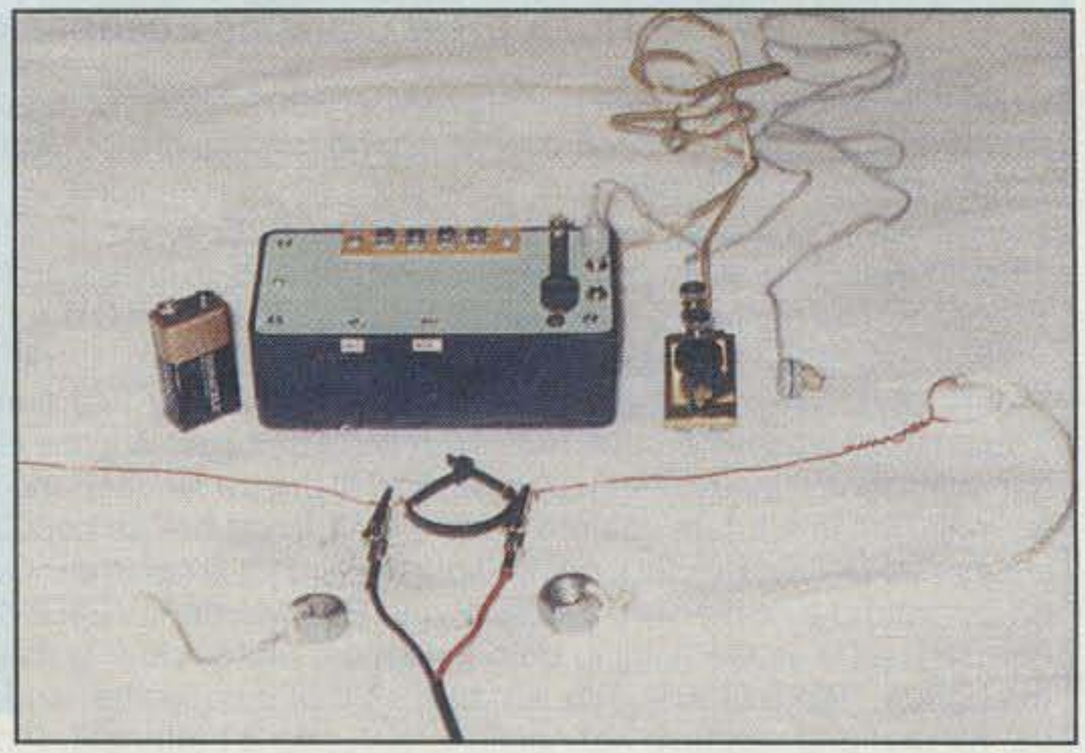

Photo 6– The "Minimalist" survival-ready setup of Walt Bullerwell, KF4YJQ, consists of a small Lectrokit "Spider Jr." transceiver and on-the-spot assembled dipole. The Spider Jr. outputs a 700 mw signal when powered from a regular 9 volt battery, giving it high appeal for emergency use. (Photo by KF4YJQ)

tioned items are placed in Ziploc® freezer bags before placing them in the backpack. Pat says his 20 years of experience as a U.S. Army Paratrooper and Ranger taught him that anything that is important and needs to stay dry goes in a Ziploc® bag. He also says that with a little imagination and some freezer tape, the bags can be shaped into a custom waterproof cover for anything. Patrick concluded by saying all of his gear must work for both enjoyment and survival, and refinements in the pursuit of perfection are continuous. Congratulations on your work in the area, Patrick. You are a true survivor!

Ham in a Box

Taking a more domestic approach to the survival radio challenge, Bill Campanelli, W2LRU, set up his ready-to-operate 40 meter station in a 14" × 8" × 10" tote box (photos 4 and 5). This "grab and go" package consists of a homebrew antenna to match balanced lines and longwires, a 12 volt DC supply for indoor use, an MFJ-9040 transceiver, an MFJ-971 antenna tuner, and a Heath keyer/paddle. Connections for power, key, earphones, and antenna(s) are accessible from the front to facilitate quick and convenient setup and minimum "behind rig" fumbles. You just set the box down, open the lid, connect the lid-stored goodies, add the antenna, and start communicating.

Supporting Bill's box station is a Recoton portable battery with internal charger, a fishing reel reloaded with thin insulated wire for a toss-up antenna, and a 40 meter Hamstick for operation indoors or around treeless areas. Using this setup Bill has worked stations throughout the U.S. and Canada. Antennas used with the rig include a 100 foot ladderline-fed doublet, a Delta Loop, an indoor 33 foot wire antenna, and the Hamstick. Our compliments to Bill, W2LRU, for showing us how to put low-cost and extra gear to good use. As I always say, it is better to have it and not need it than to need it and not have it!

Small-Time Survivor

Our next survival entry comes from Walt Bullerwell, KF4YJQ, and it is a small rough 'n ready setup that uses a regular 9 volt battery for power (photo 6). Walt's mini station consists of a 40 meter "Spider Jr." transceiver purchased from Lectrokit (401 W. Bogart Rd., Sandusky, OH 44870) a few years ago and a "disposable" dipole antenna. When powered from the 9 volt battery (which can also squeeze in the 5" × 2.5" × 1.75" plastic case), the little Spider Jr. pumps out a 500 to 700 mw signal. The rig is fitted with a crystal on 7.110 MHz, which is less crowded than the popular QRP frequency of 7.040 MHz, thus improving the odds of communicating with milliwatts of power. The rig's controls of RIT and volume are recessed and screwdriver-adjustable for extra reliability.

The mating dipole, shown reduced in length to illustrate assembly details in photo 7, consists of two 33 foot lengths of thin copper wire. Small-diameter RG-174 coax cable fitted with alligator clips is used for easy feedpoint connection. The center insulator is a plastic tie wrap or cable tie, the end insulators are glass beads, and the support ropes are thin twine tied to small bolts for throwing into position. When tossed over a tree limb, the bolt-weighted twine usually wraps around the limb several times. That is why the antenna is "disposable."

Walt carries a few spare beads, tie wraps, some extra twine, and a small spool of copper wire on outings. One good yank on the feedline retrieves it for reuse, and then making another dipole for the next outing takes only a few minutes. Most portable antennas are only used for a few days, so on-the-spot dipole assembly, utilizing clip leads rather than soldering, and reusing the feedline makes good sense. Good show, Walt. We will bet many readers can put your "invisible and disposable" antenna idea to good use right now!

A Second Survival Radio Challenge?

As mentioned earlier in this column, we are now entertaining the idea of holding a second survival radio challenge, and we would like to hear your input/ opinion. This time I visualize focusing on tiny micro-rigs and personal beacons you could wear and use for communicating or reporting your presence to the "outside world" from a hypothetical disaster or emergency site. Such a unit could be used for occasional fun

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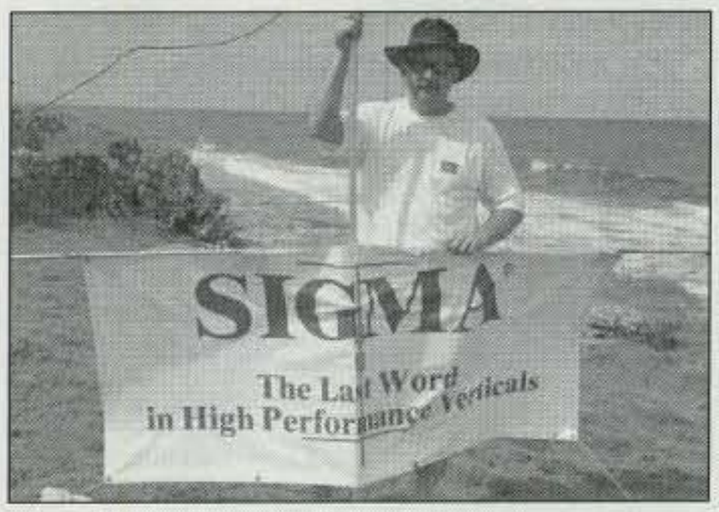

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No radials, >91-99% efficient & not "ground coupled" (bad idea)

Performance talks - Team Vertical went to Jamaica for the 2001 CQWW CW Competition using QRP (5 watts). Initial scoring shows the team passed 6 North American and 4 World Records – IN ONE WEEKEND! 20-15-10 meters used Force 12 SVDA's. 40 meters (6Y4A) used four lightweight Sigma© 40's to roar past the North American Record and almost triple the World Record.

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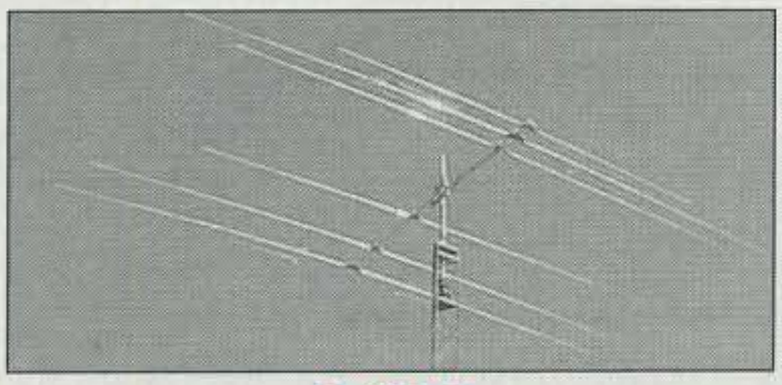

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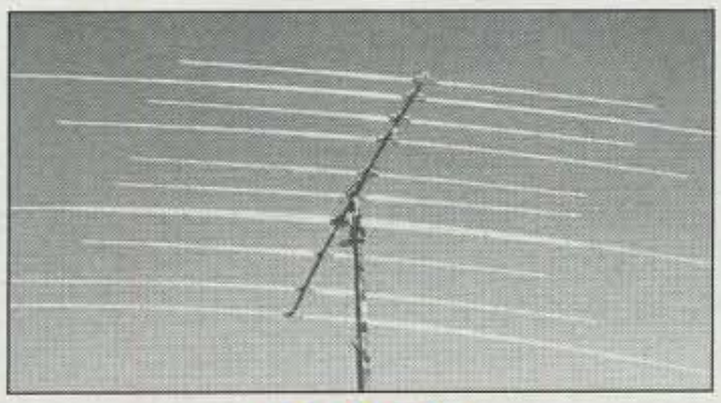
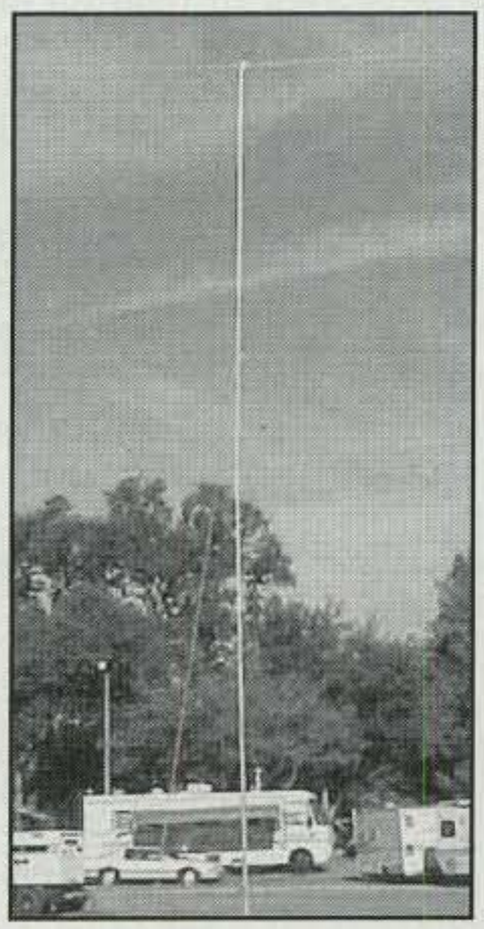
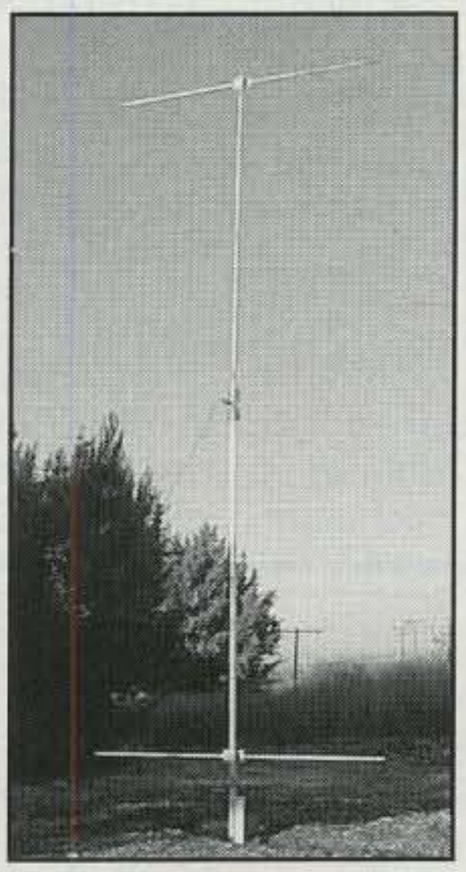


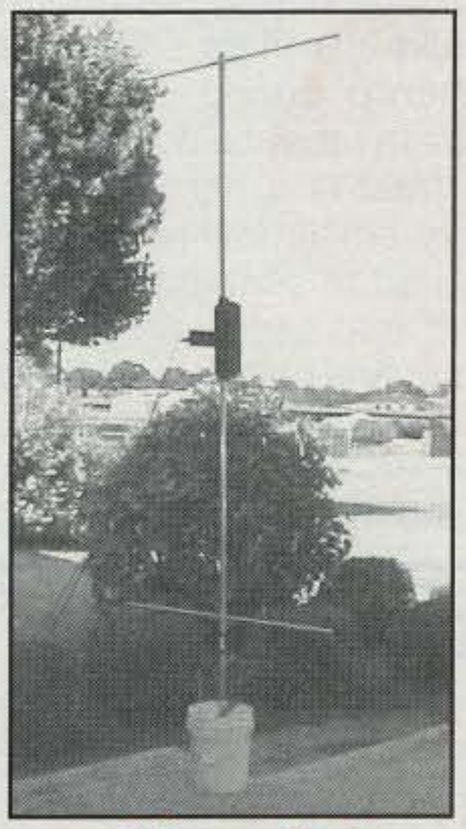
C-19XR
20-15-10 mtr Powerhouse
19' Boom, 100 mph, 5KW



Sigma© 80
80/75 mtrs, 60kHz <2:1,
36' tall, guyed once, 5KW



Sigma© 40
40 mtrs, whole band <2:1,
24' tall, free-standing,
hinge base, 5KW



Sigma© 5
20-17-15-12-10 mtrs
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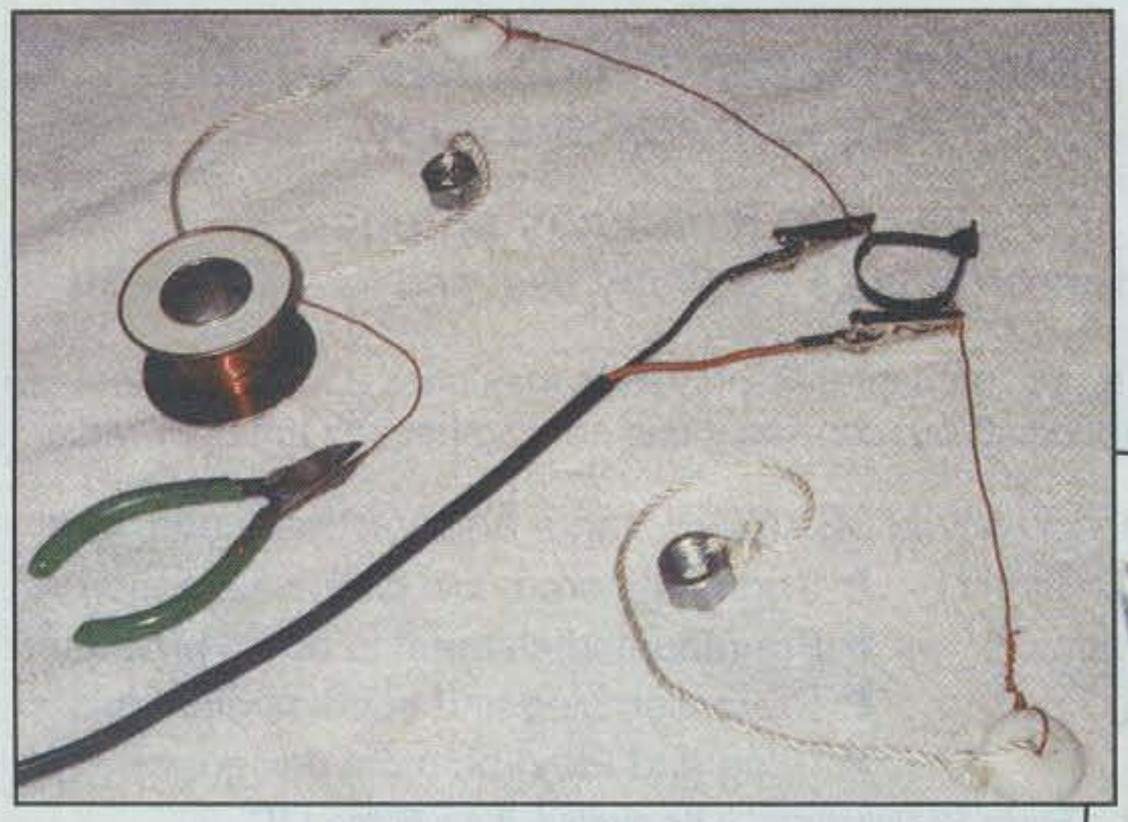

Photo 7– Mock-up (shortened) version of the disposable 40 meter dipole Walt, KF4YJQ, uses for in-field operations. Radiator is quick-cut from a spool of copper wire, center insulator is a cable tie, end insulators are small plastic beads, and pull-up twine is tied to bolts for weights. A good yank retrieves the feedline after use, resulting in an approximate materials loss of one dollar. (Discussion in text.)

Photo 8– Like to homebrew gear? This barebones transceiver is smaller than a 9 volt battery, but it could be made still smaller with surface-mount components. Are you up to such micro rig and/or personal beacon challenges? (Details in text.)

pursuits during the good times, and it could also help save lives (yours and others) during not-so-good times. Doesn't that hold merit?

What is a personal beacon? It is a very small, low-power transmitter designed to send a pre-programmed call and message at specific intervals of time. Any of the transceivers featured in this month's column and a deluxe Tick 2B or Tick 3 chip from Embedded Research (P. O. Box 92492, Rochester, NY 14692 or <www.frontiernet.net/~embres>) could be combined to produce a mini CW beacon. Devising a similar voice beacon and miniature 2 meter transmitter for FM also holds merit. Either way, the complete unit (including batteries) should be no larger than a key fob or business card, so you could carry it on your person all the time.

One example of a micro rig is shown in photo 8. Here I mated a one inch-square "Oner" transmitter (available from Bill Kelsey, N9ET, 3521 Springlake Dr., Findley, OH 45840, telephone 419-423-4604) with a one IC audio amplifier to produce a 500 milliwatt transceiver. The complete unit is smaller than a 9 volt battery and fits in a tiny tin box. If a similar (or more elaborate) rig were to be built "surface-mount style" and powered by hearing-aid batteries, the complete transceiver would be only 1.5 inch square by .5 inch thick. The challenge here thus is twofold— devising or designing the transceiver or beacon unit, and packaging it to go anywhere and survive anything.

Does the challenge hold merit? Does it pique your creative interest? You can drop me a *brief* e-mail, postcard, or QSL with your opinion, but please do not e-mail photos or expect a quick e-mail reply. I receive more e-mail than three people could answer, photos cause my e-mail to overflow, and many e-mails get deleted unexpectedly by the server. Postal notes I can read while on the move (with SASEs for brief replies) definitely have the advantage.

That wraps up the news and notes for now, but stay with us and stay safe so you can enjoy the good times ahead. If all goes as planned, our next two "World of Ideas" columns will highlight more great keys and kick off a new "Adopt A Depot" program everyone should like. Watch for them! 73, Dave, K4TWJ

On The Cover

"I must get some help from the river," says Ralph Filocco, K2IIL, of Marlboro, New York, whose 50 foot crank-up tower graces this issue's cover. "I've been on a QRP kick lately. I must have worked 15 to 20 countries on this little QRP rig (a Yaesu FT-817 with LDG Z-11 tuner), Japan, Europe, Russia, some islands, and a fishing boat off Alaska."

The river in this case is the Hudson, which Marlboro overlooks, about halfway between New York City and Albany. Ralph says it was also the river that got him started in ham radio!

"There's pretty good striper (striped bass) fishing in the Hudson," he told *CQ*. "As a teenager, I went down to the river to do some striper fishing and I saw a car with a big antenna and radio equipment, and a guy talking to people. His last name was Dwyer, I can't remember his first name, but he had a W2 call and was from down around New York City. He'd drive up to fish and operate. We talked, and then he sent me in the mail a folded dipole antenna with instructions on how to put it up, a couple of ham magazines, and an Allied Radio catalog. That's how I got started. I've been licensed since 1952 and I've loved every minute of it."

Ralph has a variety of on-the-air interests. In addition to QRP, he loves RTTY ("Every once in a while I'll go on a RTTY jag and not touch a microphone for three years!"), which he operates with a HAL CT-2100 terminal; CW and SSB on HF, with a Yaesu FT-1000MP, VL-1000 amplifier, and Cushcraft 4-element tribander, along with dipoles on 160, 80, and 40 meters; SSB and FM on VHF and UHF with a Kenwood TS-790, a 2 meter Diamond vertical and a dual-band Cushcraft beam for 2 meters and 432 MHz SSB. Overall, a well-rounded ham with a well-equipped station. (Cover photos by Larry Mulvehill, WB2ZPI)

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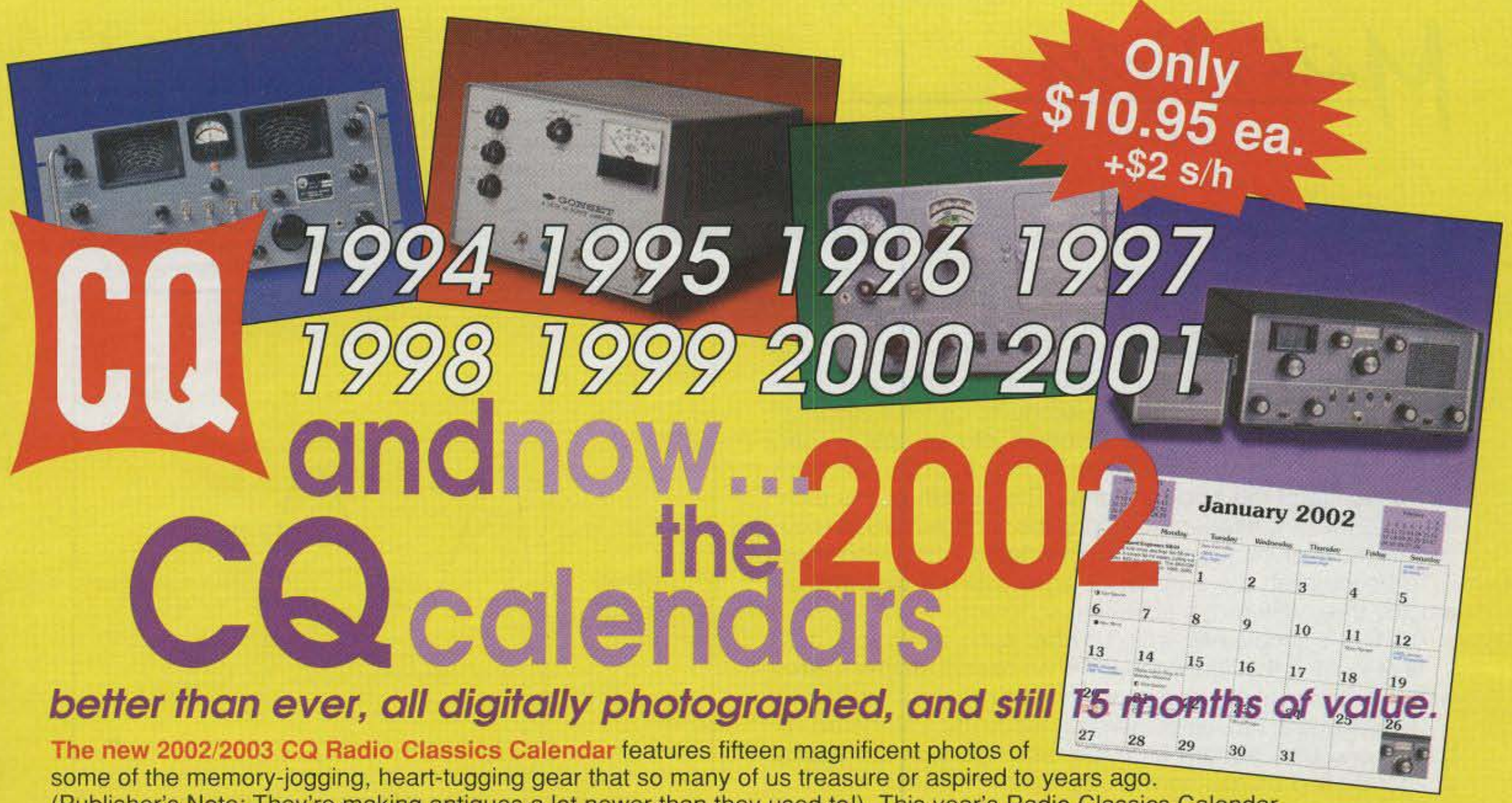

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The new 2002/2003 CQ Radio Classics Calendar features fifteen magnificent photos of some of the memory-jogging, heart-tugging gear that so many of us treasure or aspired to years ago. (Publisher's Note: They're making antiques a lot newer than they used to!) This year's Radio Classics Calendar features some of the great equipment of the '50s and '60s, with a smattering of the 1940s and 1930s.

Here's what's featured this year:

Collins 75S-3 Receiver, 1961; Lakeshore Bandhopper VFO, 1957; Gonset Commander II Mobile HF Transmitter, 1955; Gonset 913A 6 meter amplifier, 1964; Technical Materiel Corporation (TMC) GPR-92 Receiver, 1964; Hammarlund HQ-170 Receiver, 1958; McElroy Model 100 Straight Key, 1941; Sonar XE-10 Modulator, 1947; National NC-300 Receiver, 1955; Hallicrafters S-85 Receiver, 1954; Heathkit SB-500 VHF Transverter, 1969; Sideband Engineers SB-34 Transceiver, 1965; Swan 400 Transceiver, 1964; Drake TR-3 Transceiver, 1963; Utah UAT-1 Transmitter, 1937.

How many do you recognize? How many did you own? How many did you wish you owned?

The 2002/2003 CQ Amateur Radio Calendar brings you fifteen spectacular digital images of some of the biggest, most photogenic Amateur Radio shacks, antennas, scenics, and personalities. These are the people you work, the shacks you admire, the antenna systems you dream about having, all digitally captured by the talented Larry Mulvehill, WB2ZPI, CQ's own roving cover photographer. Larry's travels this year took him to Colorado, Montana, Wyoming, Texas, Florida and New York, capturing some of the greatest Amateur Radio photos of the year especially for this annual favorite calendar. From winter scenes of the frosty northeast to pedestrian mobile in the Rockies, you'll love this traveling Amateur Radio photo show.

All calendars include dates of important Ham Radio events such as major contests and other operating events, meteor showers, phases of the moon, and other astronomical information, plus important and popular holidays. The CQ calendars are not only great to look at, but they're truly useful, too!

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Math's Notes

What's New And How To Use It

BY IRWIN MATH, WA2NDM

Optical Modulation?

There is a "selfish" reason for this month's column, which is I would like you to help me (and you may also learn something from what is to follow). Those of you who know me know that I run a company that manufactures fiber-optic transmission systems. Our products convert electrical signals into optical signals for insertion into an optical fiber, and then convert the optical signals coming from the fiber back into a replica of the original signal. The benefit of this technology is that any interference along the cable run will not couple into the fiber, making the system virtually interference free.

To accomplish the transfer of signals in our systems we employ three different modulation schemes.

The first is simple AM, which in fiber-optic technology consists of varying the light intensity of an optical emitter in step with the electrical signal as shown in fig. 1.

The second is FM, where we first modulate a standard RF carrier and then square it up and use it to turn the optical emitter on and off as shown in fig. 2.

The third is digital, where the signal is first digitized by an A-to-D converter, then converted into a serial pulse train, and finally used to turn the optical emitter on and off such as in fig. 3. The problem I have is our customers have been so "conditioned" by FM radio, and now HDTV with its promise of super definition, that they do not understand the advantages, limitations, and trade-offs of the three forms of modulation, even though we go through extensive measures to try to educate them.

Since many readers of this column are technology novices and possibly "conditioned" as well, I would appreciate your comments as to how to better explain my point of view. The gist of my usual argument is as follows.

Fig. 4 shows a block diagram of a fiber-optic transmission system, in this case one designed to transmit base-band 5 MHz video. If we drive the system with a 5 MHz 1 volt pp conventional NTSC video signal (which, by the way, is AM to begin with) and the receiver reproduces the exact same signal, why should it matter what type of modulation we are using? True, if the path length is so long that noise creeps into the picture, maybe the choice of the "correct" modulation method will clear up the picture. But does it? In an AM system signal-to-noise is directly proportional to path loss whether RF or optical. In video a signal-to-noise ratio of 48 dB is usually thought of as the "cutoff point" where noise just starts to appear in a picture (as snow). It would thus stand to reason that as long as the signal-to-noise ratio is better than 48 dB, all will be okay (visually) with the picture.

A typical AM fiber-optic system usually starts off with an initial signal-to-noise ratio of about 65 to 70 dB. This means that noise will only start to appear in a picture after about 20 dB of loss. If the path loss is less than 20 dB, then an AM system will work perfectly (and will be the least expensive). With typical fiber-optic cable and inexpensive optical emitters and detectors, the light produced will accommodate about 3 to 4 km, or a mile or two, of transmission distance. Therefore, if the length of the fiber-optic cable is less than a mile or two, the least expensive system can be used. Right? Wrong!

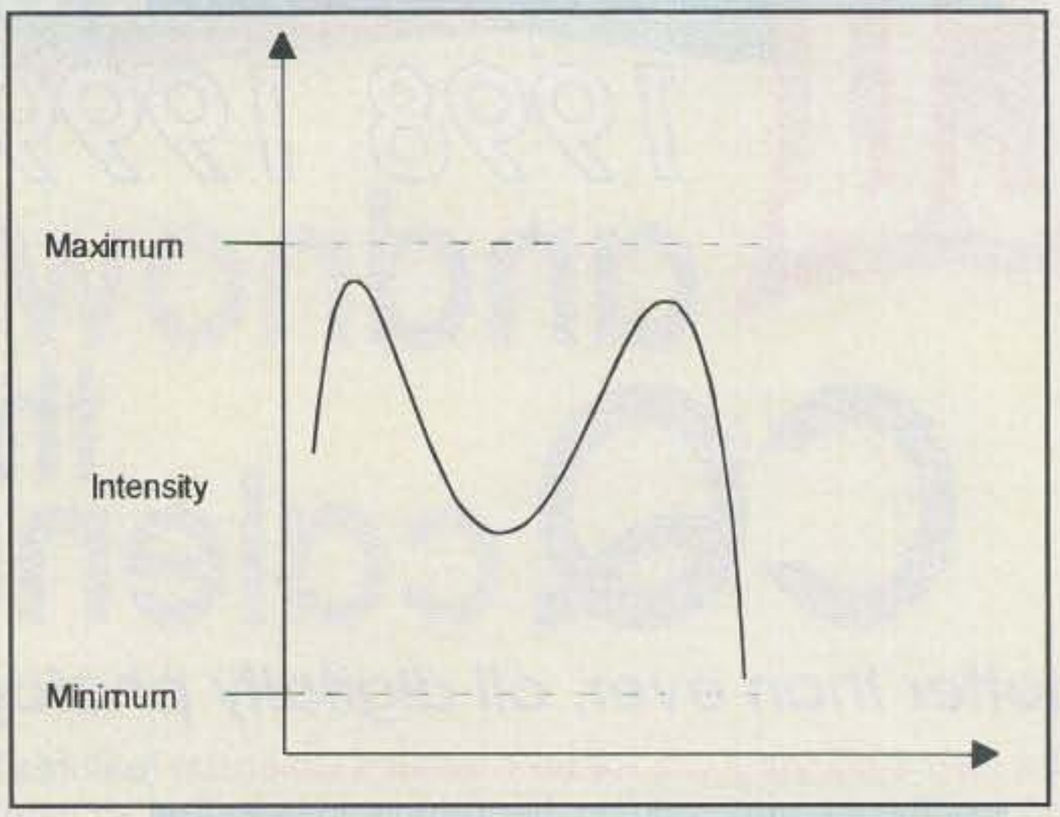

Fig. 1– Fiber-optic AM transmission mode.

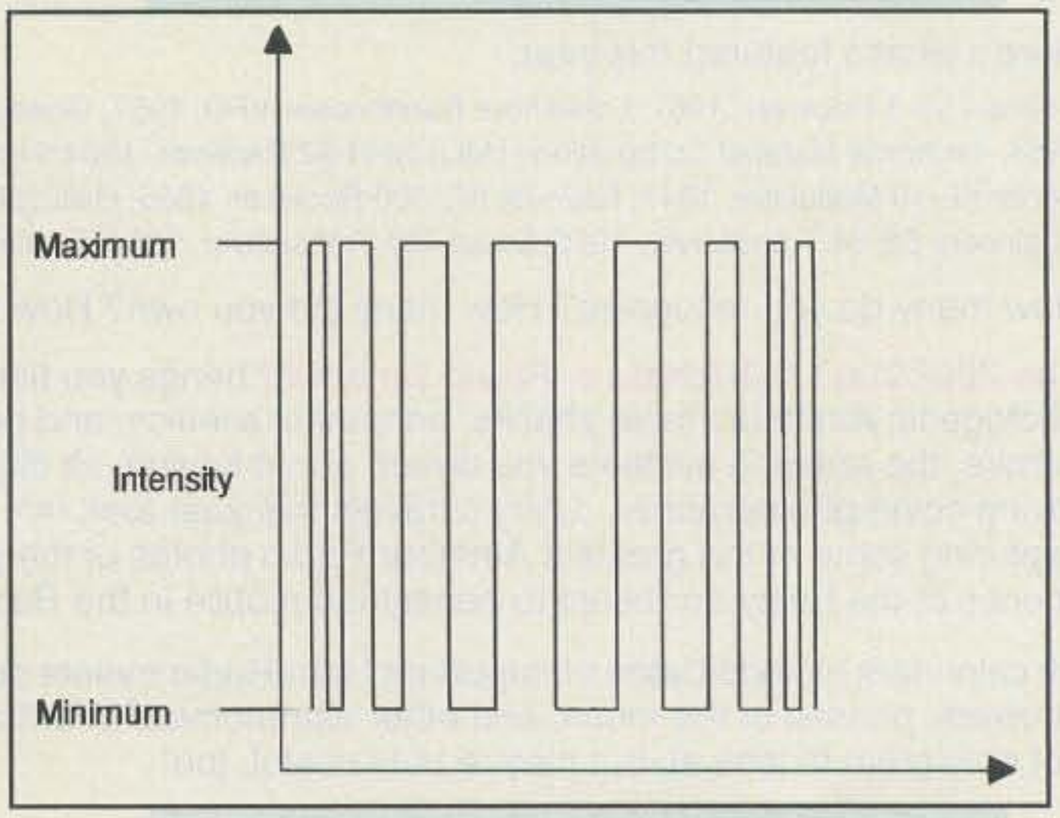

Fig. 2– Fiber-optic FM transmission mode.

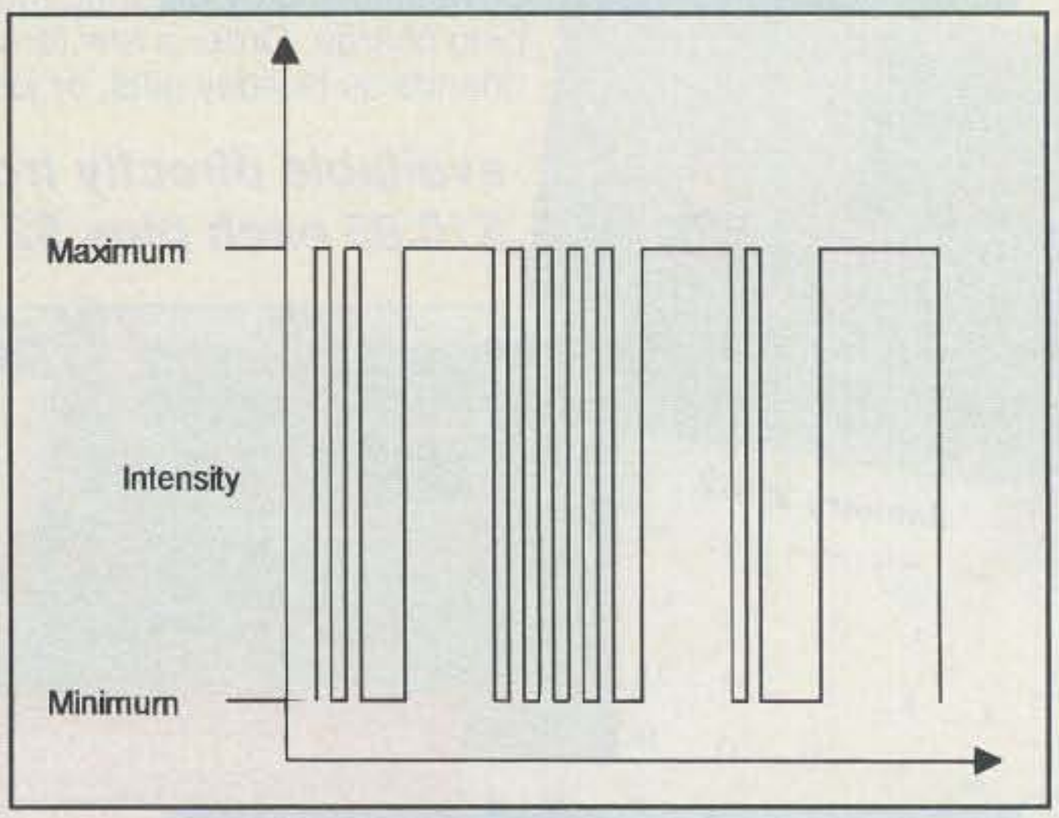

Fig. 3– Fiber-optic digital transmission mode.

c/o CQ magazine

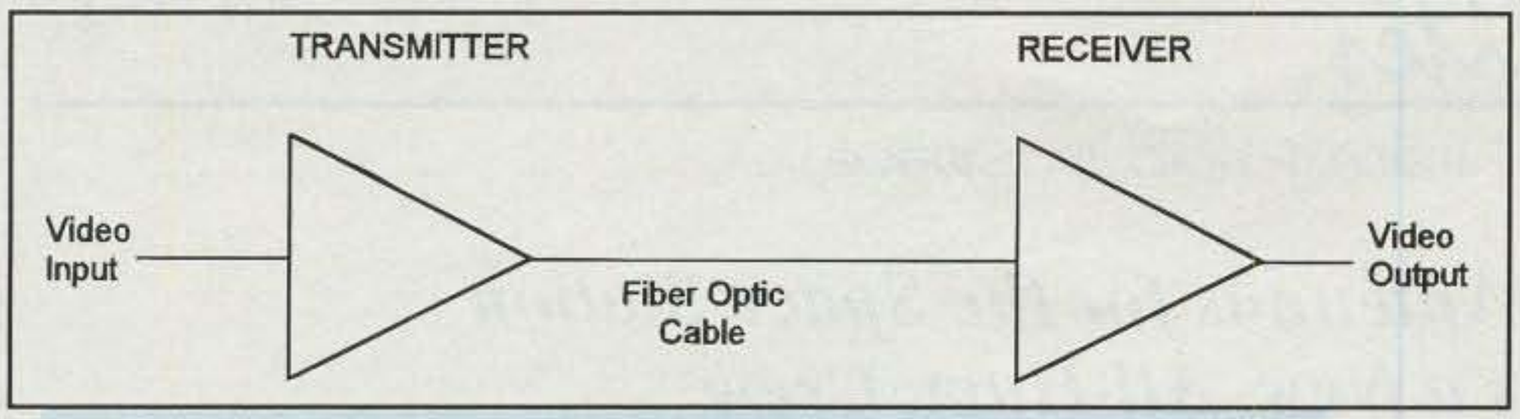

Fig. 4– A typical fiber-optic video transmission system.

The customer still wants FM! Why? Because he thinks it's better. Why does he think this? Because, the answer usually is his FM radio produces a clearer signal compared to his AM receiver. How this relates escapes me, but believe me, it is mentioned time and time again. Furthermore, these answers are from knowledgeable people who are supposed to know something about video, since they install and service CCTV systems as a main part of their business. What am I doing wrong and how would you approach this?

The next situation involves digital transmission. Some of our competitors are now providing fiber-optic transmission systems that use A/D and D/A converters to transmit video by means of encoded digital techniques. While it is true that in a digital transmission system the reception of any recognizable code (at the receiver) will result in a complete, full-specification picture, again it depends on the path loss.

To return to the first example, if the path loss is such that the signal-to-noise ratio is better than 48 dB, who cares if we use a 10-bit encoded digital system or a simple "infinite bit" analog (AM) one? Digital systems, by the way, are usually the most expensive due to the cost of the high-speed converters and the wide bandwidth needed to accommodate the pulse trains. Here understanding what you need at the receiving end can save quite a bit of money. Again, in what way would you attempt to convey this to someone who should know better?

All responses are welcome, and thank you. 73, Irwin, WA2NDM

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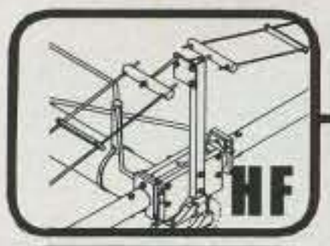

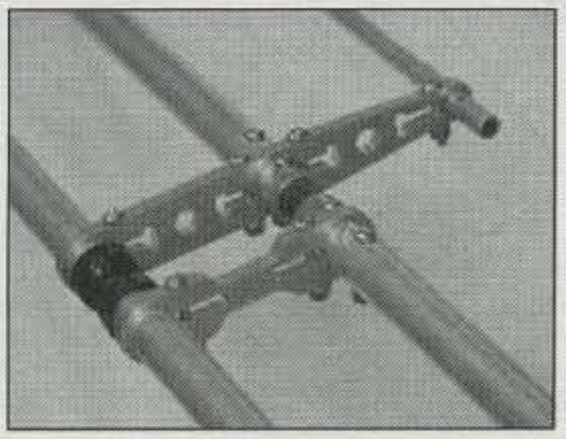

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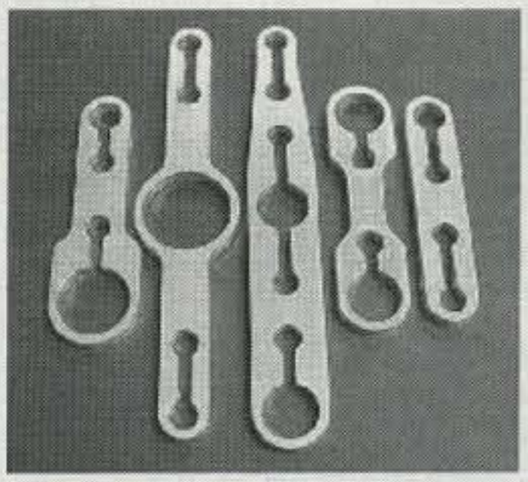

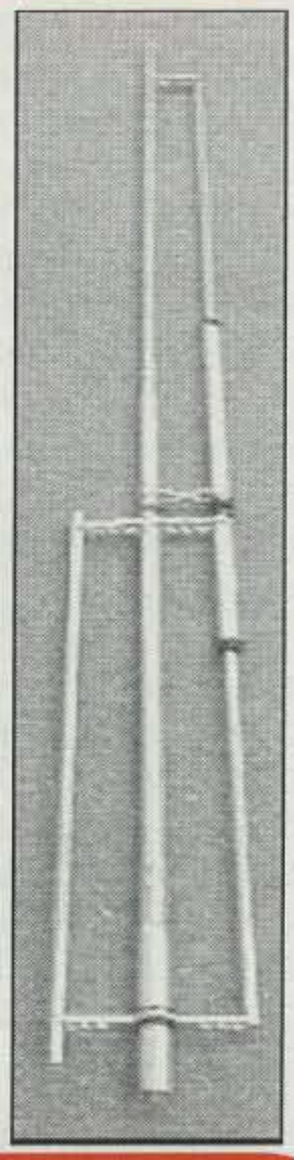

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Amateur Satellites

BY PHILIP CHIEN, KC4YER

Ham Radio in Space

New Ham Antennas for the Space Station Plus a New, All-Ham, Crew

By the time you read this a new set of ham radio antennas should be installed on the exterior of the International Space Station. Russian Cosmonaut Yuri Onufrienko, RK3DUO, and American Dan Bursch, KC5PNU, were scheduled to mount the four antennas around the periphery of the Service Module in late January.

The external antennas are an international project involving hams from Russia, Italy, and the United States. Russia provided the space on the exterior of the Service Module, the pass-through holes for the antenna cables, and training for the spacewalkers. Italy built the 1.2/2.4 GHz antenna and diplexer, and the U.S. built the HF, VHF, and UHF antennas and the support equipment.

Originally, the antennas were scheduled for installation on the STS-101 mission in 2000 and then moved to the STS-106 mission when delays to the Russian Service Module resulted in the STS-101 mission getting split into two missions (STS-101 and STS-106). However, the antenna design and safety certification was far behind schedule. NASA spacewalk engineer Mike Hess commented in August 2000, just weeks before the STS-106 launch, that he hadn't even seen a prototype.

Fortunately, an interim antenna was available. It turns out the FGB (Russian initials for Functional Cargo Block), the first space station component, used a pair of 147 MHz telemetry antennas for launch. Once the FGB arrived on orbit, the antennas were no longer needed. Several people involved, including astronauts, cosmonauts, and engineers, suggested that these antennas would be suitable for 2 meter use until the external antennas became available. Access to the antennas was relatively easy—just open up a panel, disconnect the existing cable, pass a new cable with a Russian connector on one end through an existing opening and attach it, and attach the other end of the cable with a standard BNC connector to the 2 meter radio. That was accomplished in early November 2000, shortly after the first Expedition crew arrived on the space station.

New ISS ham radio antennas installed on the mounting bracket. The orange/black strips are flexible antenna components that are extended after the antennas are installed. During the spacewalk the astronauts remove one antenna at a time and install it on the hull of the space station. The two large hand grips toward the front of the photo are designed for easy grasping while wearing thick spacewalk gloves. (Photo courtesy MAREX-NA)

The external antennas were finally finished with all of the paperwork approved in November 2000. What's especially interesting is they traveled to the space station on two separate vehicles. Cargo is shipped to the space station on unmanned Russian Progress freighters and the Italian-built MultiPurpose Logistics Modules (MPLM) within the shuttle's cargo bay. Certain types of hazardous cargo, such as propellants, can only be transported via the Progress, while scientific experiments which need power travel on the MPLM. The Progresses are one-way freighters; after they are emptied they are filled with trash which burns up when the Progress re-enters the Earth's atmosphere. The MPLMs can return results from experiments and other reusable items as well as trash intact within the shuttle's cargo bay.

Typically, U.S. cargo travels on the MPLMs while Russian cargo travels on the Progresses, but there are provisions for specialized items or last-second urgent cargo to be shipped on either spacecraft.

The Progress M1-7 spacecraft, launched from Kazakhstan on November 26th, carried the tie-downs for the coax cables. The schedule called for the launch of the antennas and other support equipment via the shuttle three days later. The Progress docked with the space station on November 28th, but its latches failed to activate. Without a hard mating there would be no way to open the hatches and unload its cargo.

With just hours to go, NASA decided to put the shuttle launch on hold until the Progress situation was examined in

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more detail. It turned out that there was a piece of debris in the docking system, presumably left there when the previous Progress undocked a week earlier. A similar docking problem with debris in the docking mechanism occurred on Mir in 1987. Thus, Russia decided to do an unplanned spacewalk to remove the debris. That was accomplished on December 3rd, clearing the way for the shuttle launch. (Under a worst-case circumstance, if the crew was unsuccessful in clearing the docking adapter it was possible that the contents of the Progress would have had to be sacrificed.)

Endeavour launched on December 5th with more security than any previous shuttle launch, being the first since the September 11th terrorist attacks. The Progress and Endeavour marked the 23rd and 24th rockets to the space station, with most of the launches within the past year.

Onufrienko and U.S. astronaut Carl Walz, KC5TIE, were scheduled to perform a separate spacewalk in early January to move a Russian crane from a storage location over to its permanent home. The crane was launched on the STS-101 shuttle mission and mounted on a temporary socket on the space station's exterior. Onufrienko performed several spacewalks when he was the commander of Mir in 1996. Walz had previously performed a spacewalk on the STS-51 mission in 1993. Bursch is the spacewalking rookie of the crew. Besides installing the ham radio antennas, Onufrienko and Bursch will install "blast shields" on some of the Service

International Space Station Expedition 4 crew: From left, Astronauts Carl E. Walz, KC5TIE, and Daniel W. Bursch, KC5PNU, both flight engineers; and Cosmonaut Yuri I.Onufrienko, RK3DUO, Mission Commander. (NASA photo)

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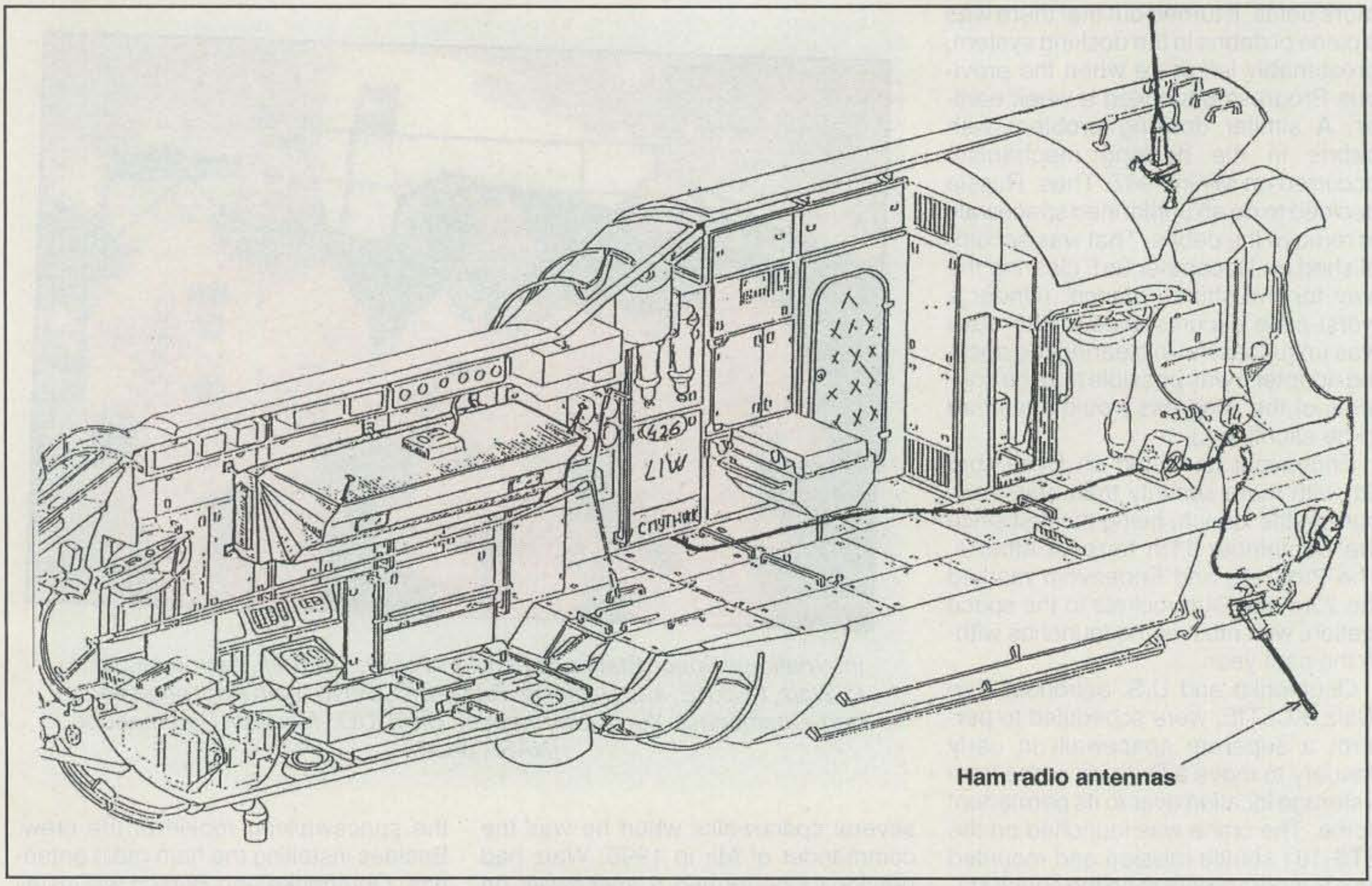

A cutaway view of the Service Module showing the eventual location of the ham shack and two of the four exterior mounting places for the external antennas. (Courtesy ARISS [Amateur Radio on the International Space Station] website)

Module's thrusters and change out materials exposure samples.

The four antennas will be mounted at 90-degree intervals around the rear of the Service Module. Three of the antennas are identical—ground-plane antennas for 2 meters and 70 cm. The fourth antenna consists of an HF whip and the L/S Band microwave antenna. The HF whip is designed to operate at 10 meters and may also be usable at 15 and 20 meters. The L/S antenna for 1.2 and 2.4 GHz will be used for Russian spacesuit communications as well as its ham radio functions. Each of the antennas clamps on to an existing handrail on the Service Module's exterior.

The 2 meter, 70 cm, and HF antennas are classic ham radio satellite material—off-the-shelf carpenter tape measures. The metal tapes have been covered with Kapton tape as protection against the space environment and also to ensure that there are no sharp edges which could damage a spacesuit.

Also flying on the Progress is a microsat, Kolibri-2000. It is similar in design to the hand-launched "Sputnik Jr." which was launched from Mir. The plan is to mount the Kolibri within the Progress spacecraft's docking adapter after the Progress has been loaded with all of its trash. The Kolibri would be ejected after the Progress moves away from the space station but before its re-entry burn. The Progress M1-7 should undock in mid-February, but given the problems with its docking, managers may decide to hold off on the Kolibri mission unless the cause of the problem is fully understood.

Kolibri is a joint Russian-Australian educational project with several experiments. Its web page is <http://www.iki.rssi.ru/kollibri/mission1_e.htm>. Kolibri is expected to transmit on 145.825 MHz, and based on previous microsats, it should be able to be monitored on a handheld 2 meter radio with a stock rubber-duckie antenna. Its batteries will only last about a month or so, and it will remain in orbit around one to four months before its natural re-entry.

The current plans call for the existing 2 meter ham radio rig to remain within the FGB using the old antennas for unattended packet operations. The 70 cm rig will be mounted within the Service Module attached to the new antennas. There have been discussions about flying a 2 meter/70 cm mobile radio, originally a backup for Mir's ham shack, for use in the Service Module.

Unfortunately, this plan will make it much more difficult for most hams to make voice contacts with the space station. The crews spend very little time in the FGB. The FGB is primarily used now for storage and as a corridor. There are no windows, and most astronauts list viewing the Earth as their favorite leisure-time activity. As a result, this will make the crew much more likely to use the rig in the Service Module, which is where the crew spends far more time and also has access to several windows. While 70 cm is less crowded than 2 meters and has less QRM, it has the major disadvantage of far more Doppler shift (the apparent change in the frequency of a signal originating from an object in motion as it gets closer to you or farther away). With 2 meters you can ignore Doppler for most of the pass. but the three times higher frequency on 70 cm results in much more Doppler. Therefore, unless you compensate for Doppler shift, your chances of getting through are far lower on 70 cm.

There are no firm plans to use the HF or microwave antennas, but they are available for future ham radio space station projects.

Onufrienko, Walz, and Bursch are scheduled to remain on the space station through April. 73, Phil, KC4YER

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by Dave Mangels, AC6WO

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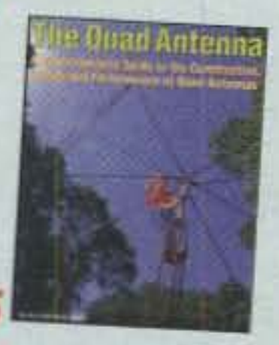

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Washington Readout

BY FREDERICK O. MAIA, W5YI

Regulatory News In The World Of Amateur Radio

What are We Regulating Here—and Why?

We're going to do something a little different this month. As a member of the Question Pool Committee of the National Council of Volunteer Examiner Coordinators, I keep in close touch with what new hams tend to know . . . and not know . . . both before and after they take their license exams. This is an essential part of trying to keep the question pools current and relevant.

Most new hams understand that amateur radio is a regulated hobby, but beyond that many get lost in the labyrinth of international and national regulations. Thus, this month instead of focusing on some specific aspect of regulation, we're going to go back to basics.

Just what is this thing called radio that we regulate? How does it work? How do you regulate something you can't see that crosses international borders without needing a passport?

Let's Start at the Very Beginning . . .

The entire subject of *radio* can be pretty confusing. You probably have heard dozens of radio terms but weren't sure just what some of them mean. Let's try to simplify and explain just how those mysterious radio waves really work.

Radios are everywhere and take many forms. Everyone has them in their homes and automobiles. A modern example of radio is the wireless mobile telephone, or cellphone (plus our ham gear, of course). We all take radio for granted as if it has existed for centuries. However, radio is actually a 20th century development. Wireline telegraphy began to give way to the invisible radio waves in 1901. Ham radio has been around since the beginning, and has been through many changes in the past century. One can only imagine the changes that will take place in the coming hundred years.

There is controversy as to who actually invented radio. Guglielmo Marconi (1874–1937) generally gets that credit. Marconi developed and patented a tuned receiver and transmitter system in early 1900 and on December 12, 1901 transmitted the first radio signals across the Atlantic Ocean. He sent the Morse letter "S" from Poldhu, Cornwall (England) to Signal Hill at St. Johns, Newfoundland. The antenna was a wire hanging from a kite.

The Russians have a different view. They believe that Alexander Popov, a Russian scientist, discovered radio in 1895, a year before Marconi began his experiments. History shows, however, that his device was basically a receiver and antenna for the detection of natural electrical waves. Popov actually wanted to be able to predict the arrival of thunderstorms. Each year on May 7 Russia celebrates "Radio Day" to commemorate the achievements of Popov.

There are other claims as well. Some believe that Dr. Mahlon Loomis, a dentist, invented radio in the 1860s. Others credit Nikola Tesla, an electrical genius who invented, among other things, alternating current and the Tesla coil.

What is Radio?

Radios are defined as devices for communicating via electromagnetic waves. A *radio wave* is an electromagnetic wave propagated by an antenna. Radio waves have different frequencies; by tuning a radio receiver to a specific frequency you can pick up a specific signal.

There are millions of radio sources—transmitters for AM/FM/shortwave broadcast stations; two-way police, fire, aircraft, and taxicab radios, mobile telephones; ham rigs; etc.—all magically working at the same time and in the same place without interfering with one another. Television, police radar, and microwave ovens also work by radio, since they use radio frequencies. We're going to focus here on two-way radio, since ham rigs shouldn't be used either for broadcasting or for cooking.

Two-way radio systems consist of two parts—a *transmitter* and a *receiver*. When both are contained in the same unit it is called a *transceiver*. When transmitting equipment generating *radio frequency* energy is connected to an *antenna,* energy is radiated into space in the form of radio waves. Some of this radiated energy is then collected by another antenna, which when coupled to a radio receiver enables a radio link to be made between the transmitter and receiver. Modulating, or adding information to, the radio carrier wave enables messages to be transmitted.

Frequency and Wavelength

Radio waves are distinguished from one another by their *frequency* or *wavelength*. Waves can be generated in a great variety of lengths. Simultaneous radio operation by many devices is possible because radio waves have different wavelengths. Receivers listen to the appropriate wavelength.

Wavelength is the length of the radio wave from peak to peak. The length of a single cycle can be many miles long or just a tiny fraction of an inch! For example, when we talk about the 10 meter ham band, we are actually referring to the length of the wave from peak to peak (10 meters or about 33 feet).

For each wavelength there is a corresponding frequency of alternating current, and it is sometimes more convenient to think in terms of frequency rather than wavelength. Frequency as it applies to radio is the number of times the wave repeats (cycles) each second and is measured in Hertz (Hz). It is named after Heinrich Hertz, the German physicist who first investigated electromagnetic waves in the mid-1800s. One Hertz is one cycle per second. Commonly used units include kilohertz (kHz), or thousands of Hertz; megahertz (MHz), or millions of Hertz; and gigahertz (GHz), or billions of Hertz. Radio frequencies range from 20 kilohertz (20,000 cycles per second) to over 300 gigahertz (30 *billion* cycles per second). This wide range of frequencies is called the *radio spectrum*.

Frequency and wavelength are related mathematically. Wavelength times frequency (in megahertz) equals the speed of light (186,000 miles, or 300,000 kilometers, per second). For example, a 10 meter radio wave times 28.500 MHz (its frequency) equals about 300 kilometers. *Signals with long wavelengths have lower frequencies, while those with shorter wavelengths have higher frequencies.*

How Radio Communication Works

Radio basically works by impressing intelligence on an invisible radio wave of a specific length (a *carrier*), sending it into

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space and separating the wanted information from the radio wave at the receiving end. Simply stated, transmitted information rides piggy-back on invisible *carrier* radio waves of known length. A receiver tunes to that wavelength and extracts the information.

Early radio pioneers found that by varying the characteristics of a radio wave—such as its frequency (in cycles per second), amplitude (its signal strength), or phase (time between similar waves)—these waves could be made to communicate information of many types, such as audio, video, and data. The process of encoding intelligence onto a radio wave so that it can be transmitted over the air is called *modulation.*

The most common modulation techniques are amplitude modulation (AM) and frequency modulation (FM). The Amateur Service utilizes FM modulation for most of its voice contacts on VHF and UHF frequencies (above 30 MHz), although a variation of AM (called single sideband, or SSB) is most commonly used at the lower frequencies.

In the process of modulation, the information or message to be transmitted is impressed (modulated) onto the carrier wave which is then transmitted over the air. When a radio signal is received (detected), the information is converted back into its original form (*demodulated*) by a receiver and output as sound, images, or data.

The Radio Spectrum

Radio frequencies occupy a small part of the electromagnetic spectrum. It is called the electromagnetic spectrum because electromagnetic waves are propelled through space at the speed of light by electric and magnetic forces. Gamma rays, x-rays, ultra-violet, visible light, and infra-red are also parts of the electromagnetic spectrum. They all travel at the same speed but have different properties and uses, depending on their frequency or wavelength.

Radio is the general term applied to the use of radio waves, signals between 20 kHz and 300 GHz. Therefore, because television, police radar, orbiting satellites, and microwave ovens use these frequencies, they are, in effect, radios! Many consumer gadgets such as garage door openers and baby monitors also work by radio. For our purposes, if a wavelength in the radio spectrum is required for an electronic device's operation, it is a radio.

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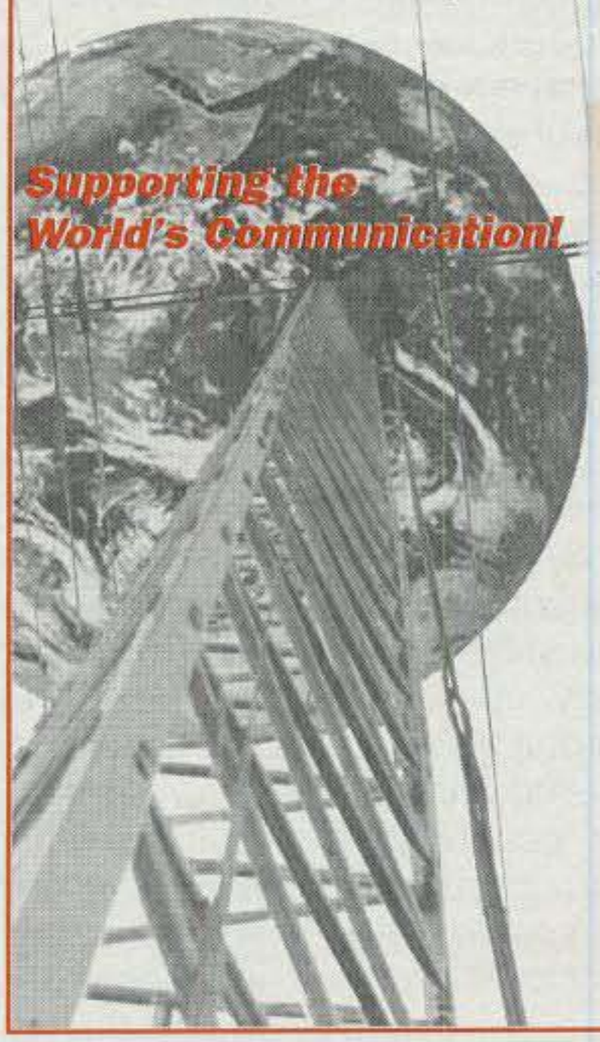

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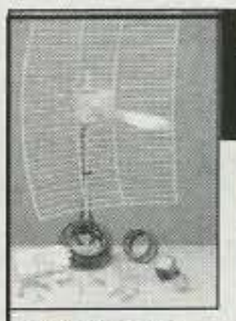

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phere, varies with the frequency or wavelength of the radio signal. As a general rule, the lower the frequency, the farther the distance radio waves will travel, although other factors may influence the actual distance covered. Radio waves may be obstructed or deflected by mountains and buildings as the frequency increases. At extremely high frequencies rainfall and other weather conditions can limit the effective operating range of radio communications. At low frequencies signal absorption by various layers of the atmosphere may also affect signal range.

These propagation characteristics mean that different bands of frequencies are better suited to different types of radio use. Radio waves are like horses carrying riders. The allocation of radio-wave use is basically a question of whose information gets to ride on which horse. While many radio stations can operate on different wavelengths (or frequencies) in the same geographical area at the same time, only one can generally operate on the same frequency at a time in the same area without causing *harmful interference*.

I say "generally," because there are techniques (such as *multiplex*ing and *spread spectrum*) by which communications can share the same spectrum. This is accomplished by dividing the signal into little pieces and transmitting them according to a formula. The signal is decoded according to the same formula on the receiving end. The width of the radio waves carrying the information is called the *bandwidth*.

Frequency Allocation

After the turn of the last century, when radio was starting to be used, everyone used the same frequencies. Receivers that could effectively separate signals had yet to be developed and chaos ruled! Since the number of frequencies and radio stations is not without limit, a system had to be developed to regulate the use of the radio spectrum. Radio waves spread in all directions and do not respect national boundaries. Thus, an international regulator had to be established to define acceptable interference levels, set transmission standards, and decide who may operate radio stations on which frequencies. That job is a function of the International Telecommunication Union (ITU), an organization that actually is older than radio (!), as it was first organized in 1865 to coordinate international wire telegraph traffic. It was originally named the International Telegraph Union. Today the ITU is a United Nations agency based in Geneva, Switzerland.

As radio technology advances and uses change, the various nations of the world meet periodically to determine how the radio spectrum will be used. These meetings, called World Radiocommunication Conferences (WRCs), have been taking place every few years for more than 125 years. Again, they started out as international telegraph conferences. The WRCs are conducted by the ITU.

Besides determining international radio-frequency band usage, the ITU develops regulations to encourage the most efficient and interference-free use of the spectrum. It is the ITU nations that require amateur radio operators to have manual telegraphy (Morse code) proficiency when they operate below 30 MHz. This almost certainly will be eliminated at the next WRC in 2003 (see last month's "Washington Readout" and "Zero Bias" for more on that).

The allocation of radio frequencies is further refined by region—the ITU divides the world into three geographical areas each with its own regional frequency allocations (North and South America are located in ITU Region 2)—and by the various national governments involved. For example, the ITU nations agree that the 20 meter ham band extends from 14.000 to 14.350 MHz. In the United States the Federal Communications Commission (FCC) regulates radio and decides which frequencies are to be used for which purposes, such as areas reserved for different modes or license classes. However, the agency must conform to the general framework established by the ITU.

The FCC also determines operator responsibilities and technical standards that apply to the various radio frequency bands, and licenses the use of specific frequencies to radio operators and stations. The FCC's regulations applying to the Amateur Service are contained in Part 97, Title 47 of the Code of Federal Regulations. Its legal basis is in the Communications Act of 1934 as amended.

A Band By Any Other Name

In the previous section we mentioned radio frequency bands, specifically the 20 meter amateur band. Just what is a *band* anyway? The radio spectrum is divided into bands that correspond to various groups of radio frequencies. These bands are identified in many ways—by their frequencies, wavelengths, descriptive acronyms, and

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uses. You thus can refer to the same band in a number of ways.

Several types of descriptive names have been attached to various portions of the spectrum. One method denotes relative position in the spectrum—very low frequency (VLF), high frequency (HF), very high frequency (VHF), and super high frequency (SHF). It is also common to refer to radio bands by their wavelength in meters, such as the 11 meter CB band, the 19 meter international broadcast band, or the 2 meter amateur band.

Another method derives from usage developed in World War II to keep secret the actual frequencies employed by radar and other electronic devices, such as the L-band, S-band, and C-band. The frequency used by police radar and the detectors purchased by consumers usually are referred to in that manner. X, K, and Ka band radar detectors sound more exotic than those at 5, 10, or 20 gigahertz!

The ITU classifies frequencies according to band numbers—Band 1, Band 2, etc. Frequency bands are also known by the services that use them—the AM and FM broadcast band, the ham band, the shortwave band, the business band, the police band, and so on. Thus, the 420–450 MHz ham band is also correctly labeled as a UHF band, L-band, or the 70 centimeter band.

Shortwave radio, an expression first used in the 1920s, is now a relatively meaningless term. It simply meant those wavelengths which were shorter than those in use at that time, which was around 100 meters or 3 megahertz. Thus, the *high-frequency* (HF) shortwaves began at 3 MHz. Today even shorter *microwave* (another irrelevant term) frequencies up in the gigahertz range have great radio communications value. The usable wavelengths just keep getting shorter. Most radio amateurs consider shortwave radio to mean communications taking place on the high frequencies (essentially in the 3 to 30 MHz range) which are refracted back to Earth from the upper atmosphere.

Transmission Characteristics

The physical properties of radio waves determine how far radio signals can travel. The Amateur Service is allocated various bands of frequencies each of which have different distribution, or *propagation,* characteristics. Several factors affect the transmission of radio signals. All radio signals are *attenuated,* or reduced, as they pass through rain or any kind of water in the air such as clouds, snow, or sleet. The higher the frequency, the greater the attenuation, or signal loss. This makes radio communication, especially over long distances, extremely difficult above 10 GHz.

Radio waves may travel from the transmitting to the receiving antenna by three kinds of paths: *ground waves* travel along the surface of the Earth, *space waves* travel line-of-sight through the air, and *sky waves* are returned to Earth from the upper atmosphere. The route that a radio wave takes is primarily dependent upon its frequency.

Radio waves are also bent and/or reflected as they pass through the various layers of electrified (*ionized*) particles of the upper atmosphere. At night some of these layers disappear or merge, which greatly affects communications capability. If atmospheric con-

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ditions are right, radio waves are also bounced, or *reflected,* in different directions from the *ionosphere,* the top layer of the Earth's atmosphere. This bending is called *refraction,* much like a rock skips across, or is bent out of, a pond when thrown across it just right.

Ionospheric reflection enables some radio signals to travel thousands of miles and accounts for the long-distance communication that is possible in the high-frequency band. The ionosphere varies in height from 50 to 200 miles above the Earth. Lower radio frequencies are more easily bent and bounced around. The area between the transmitter and where the sky wave returns to Earth is known as the *skip zone*. Generally, you cannot hear a signal if you are within the skip zone, as it "skips" over you.

Above certain frequencies atmospheric conditions are such that there is little radio signal refraction and reflection. The point at which this occurs is called the *Maximum Usable Frequency* (MUF) and is generally in the range of 10 to 15 MHz. It can be as high as the 6 meter ham band (50 MHz) or as low as the 80 meter ham band (3.5 MHz), depending on time of day, season, atmospheric conditions, and a curiosity known as the *sunspot cycle*.

Storms on the surface of the sun and their associated magnetic disturbances have a marked influence on radio communications. The intensity of these solar storms, which appear as dark spots on the sun, historically run in cycles of approximately 11 years (*we are just past the peak of the current cycle, or possibly heading for a second peak. See this month's "Propagation" column for details.—ed.*). High sunspot activity results in longer periods of profuse ionization with accompanying increased sky-wave propagation at the higher HF frequencies. This is always good news for amateur DX operators! They can carry on international communications for a longer period of time on the 15, 10, and often the 6 meter bands.

Below the MUF radio signals can be used for long-distance communication by reflecting the signal off the ionosphere. At frequencies above the MUF radio signals travel in a straight *line-of-sight* from the transmitter to the receiver. The distance a line-of-sight signal can travel is usually limited to the horizon, although the radio horizon is generally a little more distant than the visual horizon. The higher the antenna, the farther the signal is likely to travel (since the horizon appears farther away). Line-of-sight transmission requires that there be no obstacles between the transmitter and receiver. A building or mountain will block the signal. Communications on the popular 2 meter ham band generally propagate by line of sight, although there are exceptions (see below).

Line of sight also applies straight up. Signals above the MUF travel straight through the atmosphere and into space. These *uplinked* signals can be captured by an orbiting satellite and retransmitted (*downlinked*) back to Earth by an on-board radio *transponder*. Hams have had satellites in orbit for 40 years.

Since VHF/UHF signals generally have a limited range, individual frequencies may be "re-used" by a distant station without interference. One of the basic functions of spectrum management is to locate radio stations operating on the same frequency at specified distances from each other to reduce interference. In the Amateur Service this is handled by volunteer frequency coordinators.

Atmospheric conditions can greatly affect line-of-sight radiocommunications. Differences in atmospheric temperature or the amount of water in the air can cause radio signals to travel far beyond the usual line-of-sight distance. This condition is called *ducting*. At such times signals travel for many miles beyond the horizon just as though the Earth were flat. In addition, auroras and the ionized trails left by meteors can enhance communication range on VHF and UHF.

There you have it! A capsule version of the characteristics of the remarkable radio wave and how many stations can operate on different wavelengths in the same geographical area at the same time without interfering with one another. The radio spectrum is an incredibly valuable natural resource. Just think of all of its applications: microwave cooking, public-safety communication, international broadcasting, time signals, communications satellites ... and more!

The Amateur Service is very fortunate to have such wide access to its various bands. In a way, ham operators are like the American Indians, who have been herded onto reservations. If we did not have the frequencies first, we probably would not have them at all now.

73, Fred, W5YI

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Beginner's Corner

BY PETER O'DELL, WB2D

For the Newcomer to Ham Radio

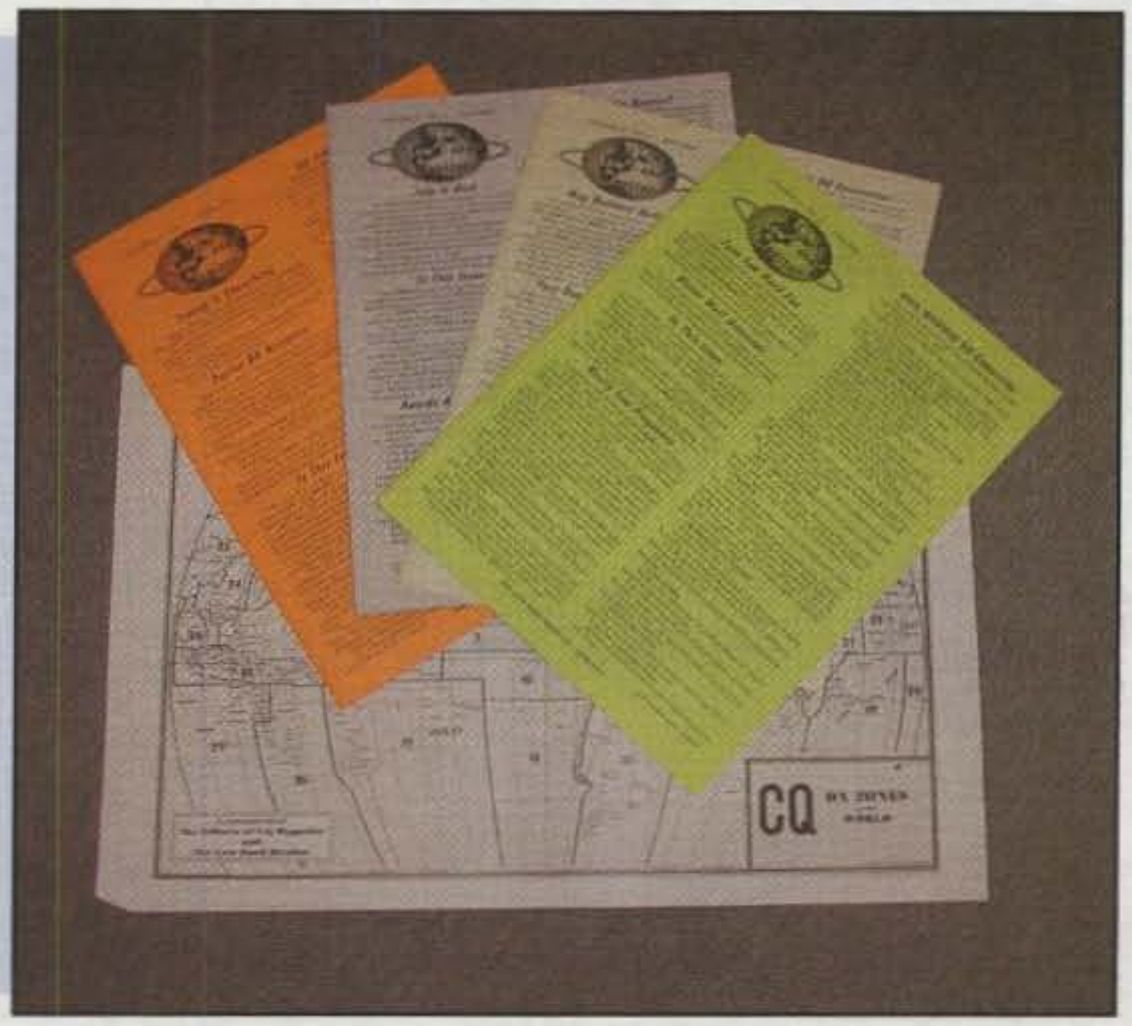
Long, Cold Winter Nights

In most parts of this country it is getting dark early these days. I suppose Congress could pass a law insisting that it not get dark before 7 PM. My younger daughter would vote for that. However, it probably would be no more effective than Indiana's 1849 attempt to legislate that pi equals 3. That one never seemed to catch on with the scientific community.

This sunspot cycle has been a little weird. By now things should have cooled down a bit more than they have. Time marches on. The meltdown will come. Think ahead a year or two. Will the bands be the same then as now? Not very likely! Openings on the usual DX bands will be pretty much limited to daytime. There is the old saying, "Don't put all your eggs in one basket." Maybe it's time to look around and check out some possible alternatives for or additions to your DX habit.

What is the DX-minded ham to do when at sundown 10, 15, and 20 close up tighter than a liquor store in the middle of a riot? TV has been pretty much a waste of time since Seinfeld left the air—at least before Letterman comes on late at night. Computer games get boring after a bit. Where is the challenge? For some, the low bands offer refuge during the long, cold nights.

What are the low bands? This designator is usually reserved for 40, 75/80, and 160 meters, and it is in the dark of winter nights at the bottom of the sunspot cycle when these bands actually come into their own. It is not without significant challenge, though. We'll take a look at some of the challenges (and the excitement) of these bands.



"The Low Band Monitor" is a long-standing newsletter devoted entirely to low-band operation.

Receiving Antennas For the Low Bands

First of all, there is the matter of antenna size. An ordinary dipole on 80 meters is around 125 ft. in overall length (by the way, a dipole probably is not the antenna you want for DXing on these bands). You can double that for 160. An average city lot is on the order of 40 ft. wide and maybe 100 ft. long. There is a bit more room if you live in the suburbs, but any way you look at it, "antenna farm" takes on a whole new meaning when you talk about these bands.

A good transmitting antenna may not be the best receiving antenna either. This is particularly true on 160 meters. Atmospheric and manmade electrical noise can drown out even the stronger signals, not to mention the weak ones that the DXer is often interested in.

The classic receive antenna is the Beverage. A traditional Beverage is a full wavelength of wire running in a straight line and mounted only a few feet above ground. It is terminated at the far end with a 450 ohm resistor to ground. The antenna should be positioned as far away from anything metallic as possible. Directivity is off the terminated end of the antenna.

Lance Johnson, KØCS, tells me that in his area (Colorado) the null off the back of the antenna increases dramatically with a lower-value terminating resistor. Two-hundred ohms seems to work well for him. All you need to determine the best value for your soil conditions is a 1000 ohm non-inductive resistor and someone listening in the shack. Tune to a high-end broadcast station near the top of the broadcast band and located directly off the back end of the antenna. Adjust the potentiometer for the deepest null. Measure with an ohm meter, and replace the pot with a fixed noninductive resistor.

Incidentally, KØCS is the editor of "The Low Band Monitor," a long-standing newsletter devoted entirely to low-band operation. In terms of ancient history, we were classmates in high school and got into ham radio at the same time.

Serious low-band DX stations are ranked in terms of acres of undeveloped land. Forty acres or more is probably a good "guesstimate" as a minimum of what is needed. Why? Obviously, you cannot rotate the antenna. Therefore, a "typical" arrangement for a first-class low-band station might be to have two "pods" of Beverages—one east and one west of your shack. Each pod would have four or five Beverages separated by 30 degrees—remotely switched, of course. I read about a fellow who had such an arrangement a few years back. He reported that the noise went down dramatically when he moved the feed point of each pod 1500 feet from his house. Do the math, and start calling the real estate agents. Sure.

Okay, that's the bad news. The good news is you can still have fun using compromise antennas. Although the performance is not as good, these antennas are microscopic compared to a Beverage farm. The loop antenna is at the

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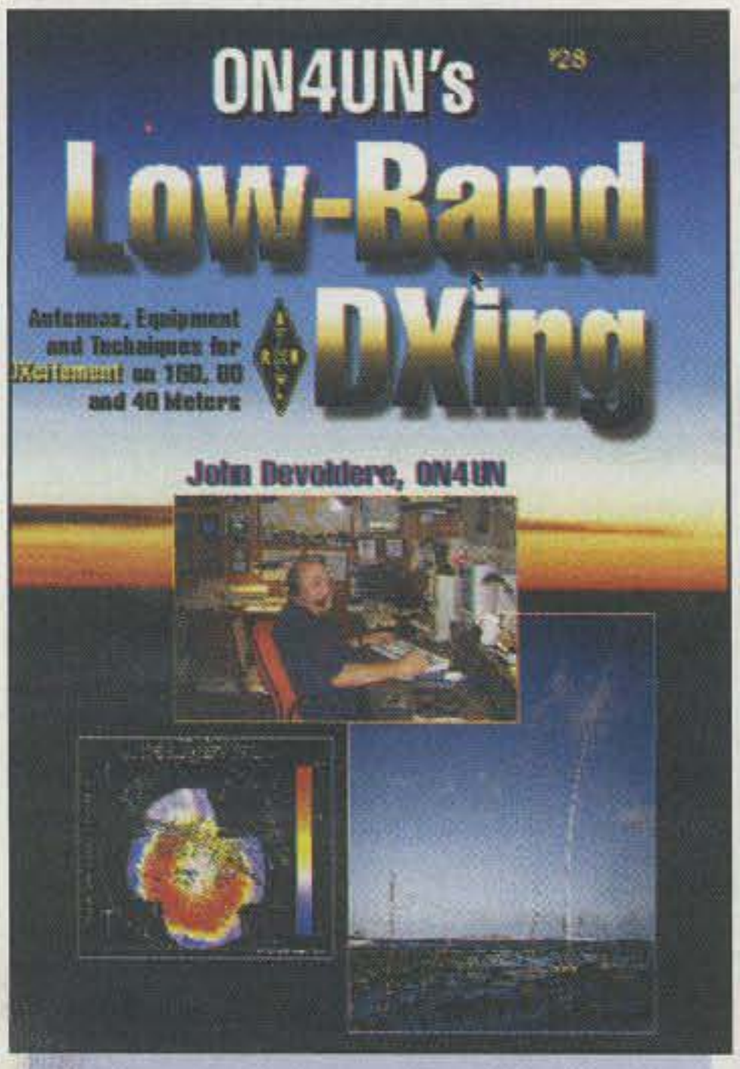

Check out the book Low-Band DXing *by John Devoldere, ON4UN, a well-known DXer. It is available from the ARRL.*

heart of most of these antenna designs. Good results can be obtained with loops 10 ft. in diameter. Recently, the "pennant" format has gotten a lot of attention. Information on loop antennas is widely available.

KØCS suggests another approach for the land-starved suburbanite—use OPL. Entrepreneurs are taught to use OPM (other people's money) to leverage their business ventures. Likewise, you can use "other people's land" to further your low-band enterprises. You can do this with permission, or since your operation is all at night, you can do it the sneaky way. Personally, I vote for the sneaky way. *(I, on the other hand, vote for permission. Trespassing isn't the best way to promote neighborly relations. You decide.—ed.)*

KØCS favors using insulated wire and one of those "reels" for long extension cords that you find in hardware stores. You just roll up the wire onto the reel and attach the free end to your feed line. When you want to operate, just walk out through the backyards or whatever unreeling the wire. When you are done operating, roll up the wire on the reel.

By the way, dropping the wire directly onto the ground has a name—BOG. This stands for Beverage On Ground. Some stations have adopted this approach for permanent installations. If you do this, make sure you keep the lawn mower away.

I once lived in an apartment building that backed on a swamp. The lease had a very explicit clause prohibiting outside antennas. One Sunday some ham friends came over, and we spent the afternoon stringing wire through the trees in the swamp. We were using the "sling shot and fishing pole" method of running the wire through the trees. The wire was stranded #20 or 22; consequently, it was strong enough to hold up and yet hard to see. It went unnoticed while I lived in the apartment.

The only problem came while we were stringing the wire. A 10-year old boy was curious as to what we were doing. He kept asking questions, and I kept ignoring him, hoping he would go away. One of my friends seemed to be becoming unnerved. I was afraid he was going to blurt out what we were up to. I could see it all clearly. The kid goes home and tells his parents. They call the apartment manager and complain about TV reception. My antenna comes down faster than it went up.

I turned to the kid, giving him my best "crazy man" face, and said, "Oh, I have to put up this wire to keep the UFOs away. If I don't, the UFOs bug me day and night, but the minute I put one of these up, they go away and leave me alone." The kid backed up about ten paces and then ran like crazy. Even if he told his parents, all they would have said was for him to stay as far away from me as possible. Pity.

Transmitting Antennas

So far we have just been talking about receive antennas. What sort of antenna do you want to use to transmit? In general, dipoles are out for anything other than 40 meters. Why? To get a decent take-off angle you would have to raise the dipole a couple of hundred feet in the air. If you have a pair of 150–200 ft. towers in your backyard, you are one lucky ham.

Most entry-level low-band stations are going to go one of two routes for a transmitting antenna: a vertical or an inverted L. I've used vertical antennas on and off since I got my first ham license. I don't recall ever putting up an inverted L. The only significance you should draw from this is that I don't have any personal experience with that particular configuration. The hams who use the inverted L seem to like it a lot.

Verticals work really well—if you have a good ground. Unfortunately, unless you live in a swamp, that probably means installing buried radials. Conventional wisdom says more is better, and size *does* matter. The radials should be a quarter-wavelength long. Doubling the number of radials, up to about 100 yields significant improvements each step of the way. Going beyond 100, the net marginal increase in efficiency is minimal. Not worth it.

I am basically rather lazy and frugal, though. Even if you use a powered trenching machine, it is going to take a

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lot of work to get the radials buried, not to mention the expense. However, if you raise the vertical antenna a few feet above ground, it is no longer simply a vertical, but rather a vertical ground-plane antenna. The antenna purists are probably running for their guns at this point, but I think the trade-off is worth it. Instead of needing 100 radials, you can get pretty good results with three radials mounted about the same height as the base of the antenna.

I had such a setup for 40 and 80 when I lived on Long Island (one big rock with "soil" to match). The base of the antenna was about 7 ft. above ground. All I had for radials were two pieces of wire running from one tree trunk to the next at about the same height. This was probably the best 80 meter DX antenna I have ever used. *(To see why this worked, see "What on Earth?" in last month's issue.—ed.)*

In terms of the vertical itself, think about some form of top loading. Such designs are usually much more efficient than their trap/coil-loaded cousins. A capacitive hat is one way to handle this.

The Transceiver

If you are going to have separate transmitting and receiving antennas, then you need a transceiver with a separate (auxiliary) receiver input. This feature is marketed under different names, but the transceiver automatically switches from one antenna to the other as you go back and forth between transmit and receive. Without this feature built in, you will have to add an outboard box to take care of it. It is curious to note that some of the higher priced transceivers do not have this feature. If you do not own an HF rig yet, this might be one of the features you look for when shopping for one.

Also, it is good to check around on some of the websites. Some particular models with the auxiliary receiver input are prone to blowing out the front end of the receiver because RF from the transmitter gets back into them. There are small, inexpensive add-on devices to help prevent this from happening.

In Closing . . .

Low-band DXing can be thrilling and addictive. In some respects, it is like moonbouncing. You can get on and have a good time with a relatively modest station. Just know that it is going to take a big investment of resources to become truly competitive on these bands.

Now is a good time to start playing around with the low bands. Get the kinks out and refine your skills. In a couple of years the low bands may seem like the only game in town, at least for the nighttime ham.

If you would like to know more about this exciting aspect of the hobby, I recommend the following resources:

Low-Band DXing by John Devoldere, ON4UN (ARRL).

"The Low Band Monitor" (newsletter by KØCS, P.O. Box 1047, Elizabeth, CO 80107 (phone 303-646-4630; <www.qth.com/lowband>). 73, Pete, WB2D

Call for Photos and Stories

We'd like to hear from you about your experiences as a newcomer. If you have questions, we'll try to incorporate them into future columns. If you have photos (color prints or slides okay) of your station or antennas, please send them along and we'll publish the best ones. If you have a solution to a common problem that new hams experience, we'd like to hear about it so we can pass it along. You can contact me at <wb2d@cq-amateur-radio.com> or Peter O'Dell, WB2D, Beginner's Corner, 123 NW 13th St., Suite 313, Boca Raton, FL 33432.

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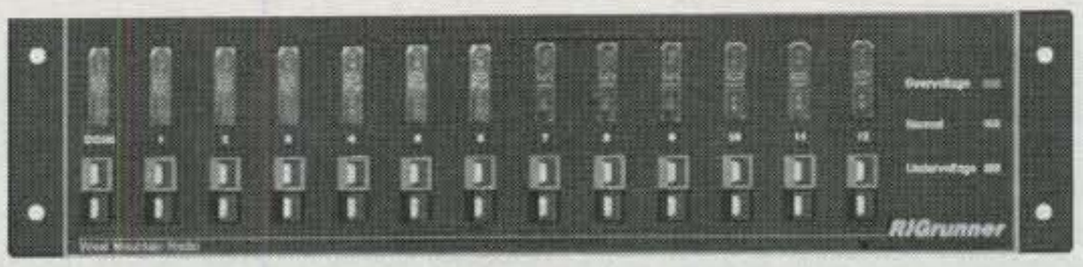

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What's New

BY KARL T. THURBER, JR., W8FX

A New Column for A New Century

February Frost and Fun

Photo A– It seems as if every time a new radio is introduced, Cutting Edge Enterprises has a new design to fit it. One of its latest products is the fine-leather Radio Glove™ especially designed for the Yaesu VR-120 Hand-Held Communications Receiver. (Photo courtesy Cutting Edge Enterprises)

February may indeed be a frosty month in most parts of the country, but that fact won't keep us from jumping right into our usual fare and fun. We'll focus on some noteworthy hamshack accessories, portable and mobile goodies, software, net news, and books we believe will be of interest to you. Stay with us!

Accessories for the Shack

New PowerPort™ Accessories from Cutting Edge Enterprises. It seems as if every time a new radio enters the marketplace, Cutting Edge's president, Roger Hall, KC6QLB, has a new design to fit it. One of the latest leather pouches is the Radio Glove ™ for the Yaesu VR-120 Hand-Held Communications Receiver (photo A). The $19.95 pouch's clip is very sturdy, and the Velcro™-style cover gives easy access to the radio. For those afternoons on the ball field with the kids, the NEO model for this radio offers extra cushioning, a strong belt clip, and waterproof neoprene material to handle the rougher terrain. It's priced at $14.95.

Also new from Cutting Edge is the WorldPack II (photo B), a compact, comfortable backpack that holds your radio—almost any modern mobile radio—in the upper compartment. The adjustable interior sling allows for a variety of sizes to fit securely with equal accessibility. The new pack is made of the same padded, heavy-duty nylon fabric as the original WorldPack. The optional power supply that fits in the zippered lower compartment is more powerful than the old model, now offering 8 ampere-hours (Ah) instead of 7 Ah. There are other upgrades, too, including a microphone wind cover and a change in color for the lacings to royal blue. The new WorldPack II is $67.95; the optional power supply kit is sold separately for $63.95.

For more details, contact Cutting Edge Enterprises, 620 Highland Avenue, Santa Cruz, CA 95060; 1-800-206-0115

Photo B– New from Cutting Edge is the WorldPack II, a compact, comfortable backpack that holds your radio in the upper compartment. The adjustable interior sling allows for a variety of sizes to fit securely. The new pack is constructed of the same padded, heady-duty nylon fabric as the original WorldPack, and the optional power supply that fits in the zippered lower compartment is more powerful than the old model. (Photo courtesy Cutting Edge Enterprises)

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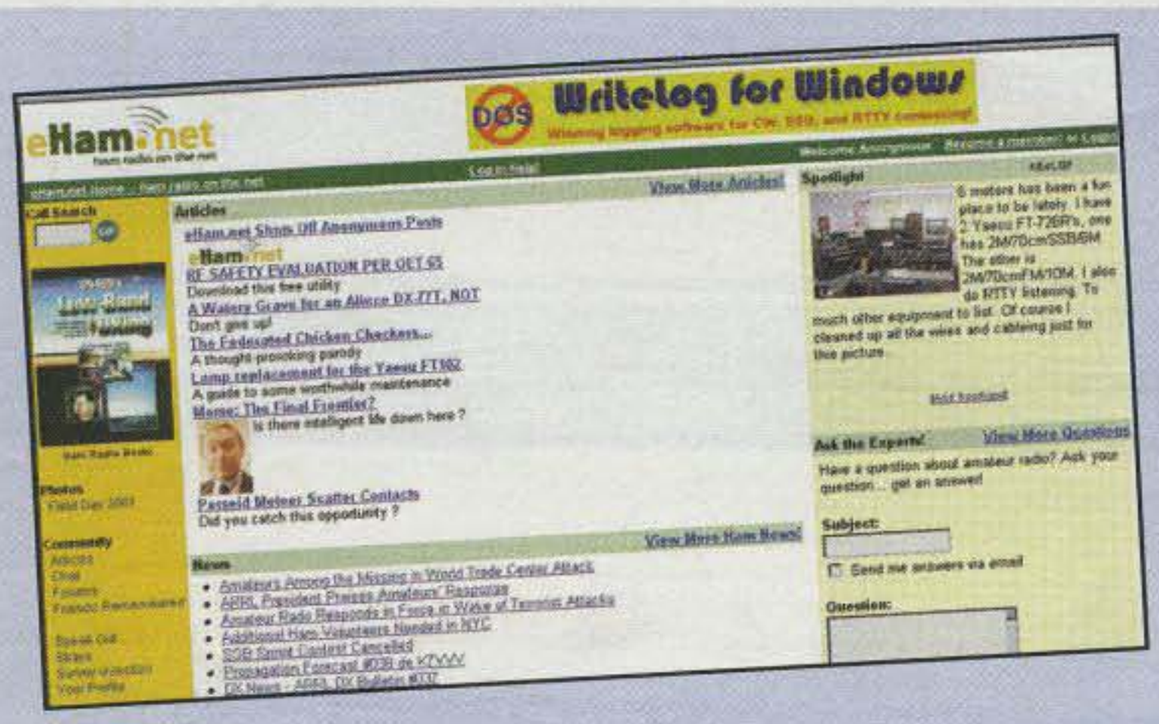

Fig. 1– The eHam.net: Ham Radio on the Net website, operated by Bill Fisher, W4AN, is billed as "as a community of ham radio operators from all over the world." Broad classifications include photos, community, operating, resources, site info, QSL managers, and ham links. Be sure to check out the website at <http://www.eham.net>. (W8FX screen capture from the eHamNet.com)

Fig. 2– The 2Way Radio Auction.com website is a new two-way radio auction site billed as "The Online Wireless Auction℠." It functions something like the popular eBay auction site, though with its auctionable equipment being oriented toward the radio enthusiast, whether commercial, amateur, or hobbyist, who wants to clean out his or her closet or excess dealer inventory. (W8FX screen capture from the 2Way Radio Auction.com)

(e-mail: <info@powerportstore.com>; <http://www.powerportstore. com>).

Novatech Bench Top Signal Generator. Don't you love really rugged, high-accuracy, "dream" equipment? Novatech Instruments, Inc., has announced the Model 2908A 100 MHz Bench Top Signal Generator (photo C) with 48-bit frequency resolution. The Model 2908A features simultaneous cosine/sine (Quadrature) and ACMOS/TTL outputs to 100 MHz, RS232 or parallel binary control, external clock input, and master clock output. The standard onboard TCXO (temperature-controlled crystal oscillator) is said to be stable to ±1 part-per-million.

Based on the Analog Devices, Inc. AD9854 Direct Digital Synthesizer Chip, the Model 2908A, at $895, has preprogrammed frequency sweep, FSK, BPSK, chirp, and single-tone modes. The optional parallel interface allows very rapid frequency, phase, and amplitude updates. An external clock input is provided so you can drive the 2908A from your own source. The RS232 control mode features nonvolatile storage of all settings. Menu-based Windows™ control software is included.

For details, contact Novatech Instruments, Inc., P.O. Box 55997, Seattle, WA 98155-0997 (206-363-4367; e-mail: <sales@novatech-instr.com>; <http://www.novatech-instr.com>).

Portable and Mobile Goodies

Alinco DJ-X3 Wide-Range Scanning Receiver. Alinco has announced its new DJ-X3 Scanning Receiver (photo D), a compact unit that can receive from 100 kHz to 1.3 GHz in AM and wide or narrow FM modes. The announcement

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was made by Atoc Amateur Distributing, which now handles Alinco products.

The new DJ-X3 has a distinctive design that places the speaker behind the display; audio is heard from ports on either side of the display window. The compact unit easily fits in a shirt or jacket pocket. It features an impressive 700 memory channels (ten banks of 70 channels). It also comes with a rechargeable Ni-MH battery as well as a dry-cell battery pack. The triple-conversion intermediate frequency (IF) stage provides excellent reception.

The DJ-X3 has several operating modes, and you can make manual selections or scan in any of the modes. There also are a number of other nifty new features. For example, the unit can reproduce FM stereo when optional stereo headphones are connected. Other features include four selectable antenna choices; a "bug" detector, useful in searching for hidden transmitters; multiple user-defined tuning steps of 5 to 100 kHz; a large, illuminated display; the ability to "clone" to other DJ-X3 units, sharing its parameters through a wire connection; and more.

The DJ-X3 has a manufacturer's suggested retail price (MSRP) of $302.95. For more information, contact Alinco through its North American distributor, Atoc Amateur Distributing, LLC, 23 S. High St., Covington, OH 45318 (937-473-2840; <http://www.alinco.com>). Also note that customer service now is obtained through the distributor.

Photo C– Novatech Instruments, Inc., has announced the Model 2908A 100 MHz Bench Top Signal Generator which sports 48-bit frequency resolution. The Model 2908A features simultaneous cosine/sine (Quadrature) and ACMOS/TTL outputs to 100 MHz, RS232 or parallel binary control, external clock input, and master clock output. The on-board TCXO is said to be stable to ±1 part-per-million. Menu-based Win-dows™ control software is included. (Photo courtesy Novatech Instruments, Inc.)

Software and Computers

AC Log 1.8 and Contesting Software Announcements. Scott Davis, N3FJP, has announced that Amateur Contact Log (AC Log 1.8) is available for download from his website, and by the time this appears in print an even newer version may be available.

According to Scott, AC Log 1.8 includes a variety of enhancements. These include support of multiple log files, bearing and distance for individual states based on the state's capital, Canadian address lookup, the ability to sort your log by date, optional Line Display on the log ListBox, copy and paste of Worked/Needed Lists generated by the log's Calculate function, customizable column order of the Main Display, and much more.

New software versions are available on N3FJP's Amateur Radio Software Site; new programs each require a modest $5 registration fee for full use unless you are upgrading from a previous version. Once you're registered, it's Scott's intent not to charge for future upgrades. Scott also offers the N3FJP Software CD, which contains the AC Log callbook and installation files for all his programs; registration is $23.

Check out N3FJP's Amateur Radio Software Site at <http://members.aol.com/snkdavis/page1.html>, or contact Scott at <snkdavis@aol.com> to be notified of updates and new releases. Registration fees—cash, checks, or money orders—may be made payable to G. Scott Davis, at 118 Glenwood Rd., Bel Air, MD 21014-5533.

Copernic Summarizer 1.5 PC Program. Copernic.com offers a number of excellent PC programs, notably the Copernic series of search engines and the Copernic Shopper series of online shopping programs. In the June 2001 column we noted a new offering from the Canadian firm, Copernic Summarizer™. As we reported, it is text-summarizing software that intelligently produces a concise resume of any web page, wordprocessing documents, e-mail messages, and other documents produced by popular application programs. The sophisticated artificial intelligence technology built into the software allows it to "understand" document content and to extract concepts in about one second.

Now Copernic.com has released a major update, Copernic Summarizer 1.5. New features include the ability to summarize most text formats, including Adobe Portable Document Format (PDF) files, and to obtain summaries

Photo D– Alinco has announced its new DJ-X3 Scanning Receiver, a compact unit that can receive from 100 kHz to 1.3 GHz in AM and wide or narrow FM modes. The DJ-X3 has a distinctive design that places the speaker behind the display; audio is heard from ports on either side of the display window. There are several operating modes, and you can make manual selections or scan in any of the operating modes. (Photo courtesy Alinco)

directly from within Microsoft Internet Explorer, Netscape Navigator, Microsoft Word, Adobe Acrobat, Adobe Acrobat Reader, Microsoft Outlook, and Outlook Express. There's also a new "Copernic Live Summarizer Bar" that lets you drag a file, text selection, or hyperlink onto the bar to obtain a quick summary. The summarization technologies also have been improved greatly for more concise summarizes in English, French, German, or Spanish. Price is $79.95.

For more information on Copernic Summarizer or any of the Copernic programs, contact Copernic.com, 360 rue Franquet #60, Sainte-Foy, Quebec, Canada G1P 4N3 (418-527-0528; e-mail: <sales@copernic.com>; web: <http://www.copernic.com>).

New on the Net

eHam.net: Ham Radio on the Net. A year ago we profiled the eHam.net: Ham Radio on the Net website, operated by Bill Fisher, W4AN. As we noted, the site is more than just another amateur radio website. Rather, it's best described as "a community of ham radio operators from all over the world."

The eHAM.net website (fig. 1) now has enhanced content, distributed over a number of community areas. Broad classifications include photos, community, operating, resources, site info, QSL managers, and ham links. Included within these broad areas are specific features such as chat, articles, contesting, DX packet spots, propagation information, news articles, product reviews, and considerably more.

Help is needed in building and managing the interactive website. For more information, check out the site at <http://www.eham.net>. You can also contact Bill Fisher, W4AN, at <w4an@contesting.com> or the website team at <team@eham.net>.

2Way Radio Auction.com. The 2Way Radio Auction.com website (see fig. 2) is a new two-way radio auction site, billed as "The Online Wireless Auction℠." The site functions something like the popular eBay® auction site, with its equipment being oriented toward the radio enthusiast, whether commercial, amateur, or hobbyist, who wants to clean out his or her closet or excess dealer inventory. The site lets you buy and sell amateur radio equipment and commercial radios, cellular and PCS phones, computers, data products, parts, and accessories, in some 33 different categories. The site is free but requires registration.

Does all this sound interesting? If so, check out the 2Way Radio Auction.com site at <http://www.2wayradioauction.com>. If you have questions, you can contact the auction administrator at <Auctioneer@2wayradioauction.com>.

From the Bookshelf

Upgrading and Repairing PCs: 13th Edition. How time indeed flies! We first took note of Scott Mueller's "how to" book in the July 1993 column, when we profiled an early edition of his *Upgrading and Repairing PCs,* which clocked in at some 1298 pages.

Now the same leading PC hardware teacher has come up with the latest in his series of massive PC resource texts. The new 13th edition is a thick PC "bible" for those who want to repair, maintain, troubleshoot, and upgrade their computers. It offers detailed coverage of the technical specifications and differences between popular "Wintel" computer systems.

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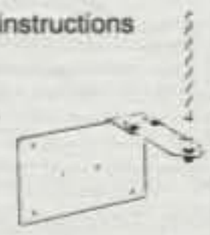
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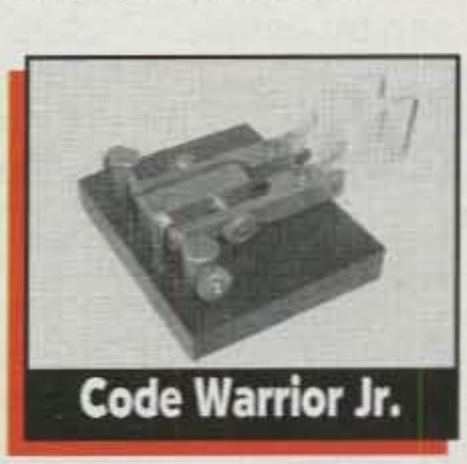
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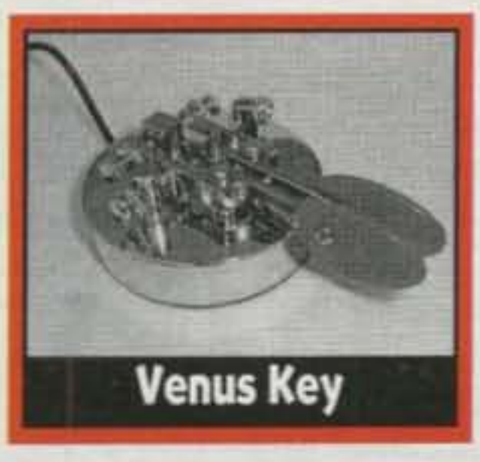
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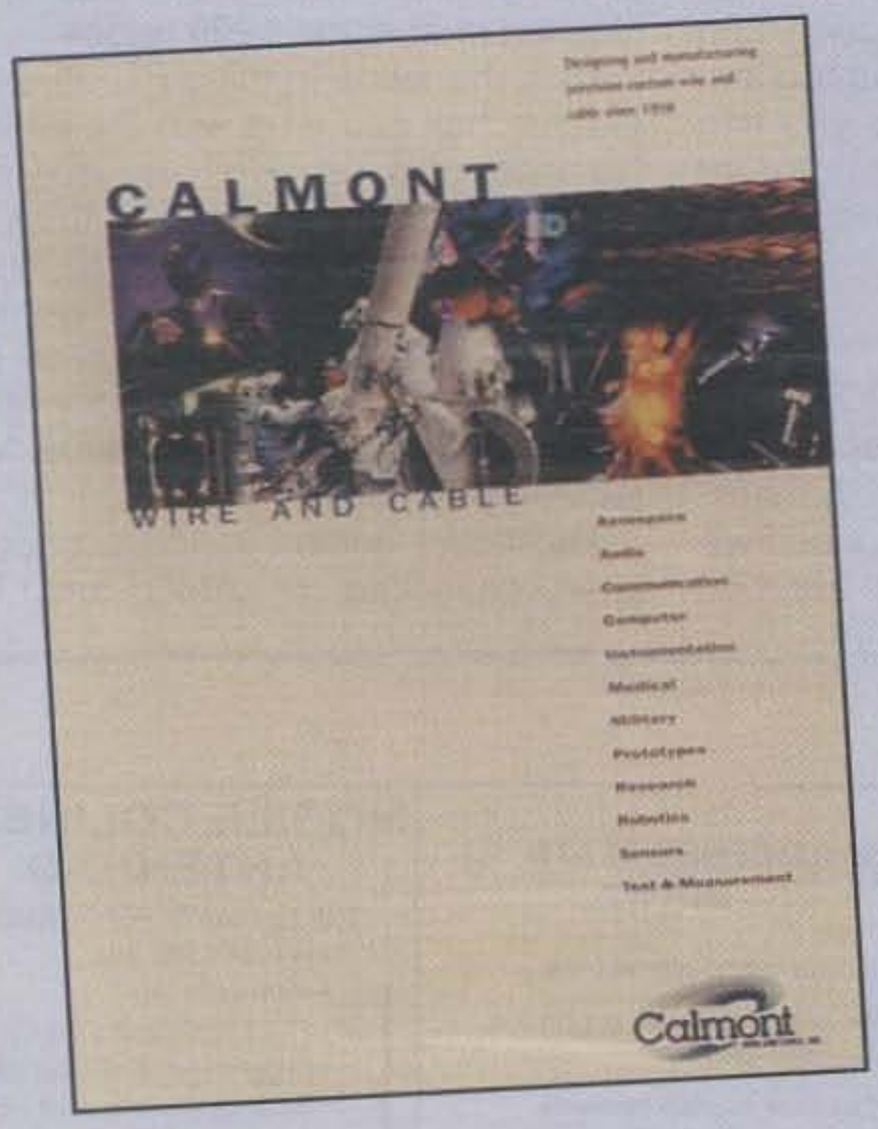

Photo E– Calmont Wire and Cable has a new 30-page catalog depicting the firm's broad range of precision custom wire and cable. The catalog is subdivided according to construction, complexity, and application, with particular emphasis on Calmont's specialized series of high-flex, high-temperature, and ultra-miniature cables. (Photo courtesy Calmont Wire and Cable)

Photo F– Jameco® Electronics' latest catalog features thousands of ICs and other electronic components, tools, test equipment, and computer products. The company claims 99.7 percent product availability and same-day shipment of orders received before 6 PM Eastern Time, Monday through Friday. (Photo courtesy Jameco Electronics)

processors, and goes to great lengths to explain just exactly what you're up against when matching motherboards and RAM to these processors. There's also cutting-edge coverage Pentium 4 processors. The Mueller book, actually a book/CD-ROM combo, also provides thorough information on PC architecture. The Que book has 1556 pages and is $59.99.

The new book is available in bookstores, or you may contact Pearson Technology Group, 201 West 103rd Street, Indianapolis, IN 46290-1097 (1-800-858-7674; e-mail: <info@mcp.com>; web: <http://www.mcp.com> or <http://www.quepublishing.com>).

Calmont Wire and Cable Catalog. Calmont Wire and Cable has announced a new 30-page catalog (photo E) of the firm's broad range of precision custom wire and cable. Being oriented especially toward technical users and engineers, it's an indispensable technical reference for many. The new catalog is subdivided according to construction, complexity, and application, with particular emphasis on Calmont's specialized series of high-flex, high-temperature, and ultra-miniature cables. While Calmont is perhaps not a name on every amateur's tongue, the company has been designing and manufacturing custom wire and cable since 1958.

For a free copy of the firm's new product catalog, contact Calmont Wire and Cable, 420 East Alton Avenue, Santa Ana, CA 92707 (714-549-0336; e-mail: <calsales@calmont.com>; <http://www.calmont.com>).

New Jameco® Electronics Components Catalog. For many years Jameco® Electronics has been serving radio amateurs with a wide variety of electronic components and equipment. The company's latest catalog (photo F) features thousands of ICs and other electronic components, tools, test equipment, and computer products. Indeed, the catalog is used by thousands of engineers, educators, radio amateurs, home constructors, service and repair technicians, and others to source leading-edge and hard-to-find components. Recent catalogs have considerably expanded coverage of ICs, transformers, computer cables, tools, motherboards, connectors, books, converters, and power supplies. Jameco also looks like a very good place to shop if you're in a hurry; the company claims 99.7 percent product availability and same-day shipment of orders received before 6 PM Eastern Time, Monday through Friday. Customers can place orders 24/7, 365 days a year via the website, toll-free telephone, or toll-free fax.

For a free, full-color catalog, contact Jameco Electronics, 1355 Shoreway Road, Belmont, CA 94002; (1-800-831-4242; toll-free fax: 1-800-237-6948; e-mail: <info@jameco.com>; on the web: <http://www.jameco.com>).

Wrap-Up

That's all for this time, gang. Next time more "What's New." See you then.

Overheard: Whether working Field Day or a DXpedition, enjoying a radio club picnic, or dining at a four-star restaurant, it's certainly a good idea to compliment the cook! 73, Karl, W8FX

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BY DAVE INGRAM, K4TWJ

The Art of Low-Power Hamming

More Neat Treats for Light Travelers

Interest in ultra-light HF'n, pedestrian mobile, and HF pack operations has noticeably expanded during the last few months, mainly because the pursuits support both portable radio fun and emergency preparedness. Yes, and these endeavors have also inspired production of some neat accessories with high appeal to traveling QRPers. Who or what started this trend you ask? No one really knows for sure. Possibly it was Don Arnold, WD4FSY, DXing from Sydney Harbor a few years ago with a battery-powered transceiver and an Outbacker antenna, or maybe it was Bonnie Crystal, KQ6XA, operating backpack portable from the Golden Gate Bridge. Possibly it was spun off from the HF'n "bumblebees" operating stand-alone style in "Power of One" QRP contests. Whatever the reason, we feel hand-carry HF'n is here to stay, and more new items for the pursuit are the focus of this month's column. Some exciting treats are anxiously awaiting their time in the limelight, so let's forego formalities and bring on the goodies!

Photo 1– The new TacPack™ from Mountain-Ops of Oregon doing its duty protecting a Yaesu FT-817. Pack has cutouts on sides for connecting microphone and earphone, plus open front and rear areas for operating the rig while it's in the pack. Other size TacPacks are available for various transceivers such as the FT-100, IC-706, K1, K2, and SG-2020.

New Mountain-Ops™ TacPack™

Carry cases for the popular Yaesu FT-817 and other ultra-compact transceivers are always in demand, and each "after market" case has its own special attractions. A shining example of that fact is the new TacPack™ from Mountain-Ops™ Communications shown in photos 1 and 2. All of the cases are made of smooth, padded nylon with folding flaps that secure in place with Velcro strips. One case holds the FT-817, one holds an LDG automatic antenna tuner, and a third case holds various accessories such as a microphone, key, power supply, and extra connectors.

The FT-817 and LDG cases are "wrap around" items with front and rear areas left open (except for a rig-securing strap) for operating the gear and accessing their rear-panel sockets. Velcro strips on the side of the FT-817 case mate with strips and flaps on the LDG case for "piggybacking" the two cases. The accessory bag (which is fitted with a long, padded nylon strap of its same width) then wraps around the other two cases, covering their front and rear areas while producing a single "all together" travel pack. Look at photo 2 and visualize setting the accessory bag on the left atop the piggyback pair on the right, and then wrapping the bag's strap (which is neatly folded below the bag in photo 2) around the pair. That's how the package fits (well, Velcros) together.

I sense your questions here, and yes, a TacPack™ case to hold only an FT-817 can be purchased separately. Every FT-817 deserves one, too. You probably are also asking if TacPacks™ are available for larger rigs such as the Yaesu FT-100, ICOM IC-706, Elecraft K1, K2, and/or SGC-2020, and again the answer is yes. Now there is definitely no excuse for "battle scars" on your favorite mobiling and traveling radios. Carry cases keep them in like-new condition.

You can get more information, study brochures, or order a TacPack™ direct at <http://www.mountain-ops.com>; by

Photo 2– The complete three-piece TacPack™ package for an FT-817-based station includes a second case for an LDG Tuner plus a wrap-around accessory pocket for a mic, power supply, and paddle. (Details in text.)

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Photo 3– The new Expedition Pack from Communication Outfitters is a semi-rigid backpack-type enclosure designed to carry a full station complete with antenna(s) cables, extra batteries, and more. Expedition Pack also supports pedestrian mobile operations with battery-powered gear and antenna extending through top flap.

Photo 4– Inside view of the Expedition Pack from Communication Outfitters with transceiver, tuner, W6MMA "Super Antenna" sections, etc., secured in pouches for traveling. This pack is designed to hold a Yaesu FT-817, LDG tuner, and extra battery packs, or a dual-band FM setup such as Yaesu's FT-5100 or FT-8500. Another version is designed to hold larger transceivers such as an FT-100 or IC-706. (Details in text.)

mail from Mountain-Ops Communications, P.O. Box 214, Hubbard, OR 97032; or via telephone at 503-982-5786. Tell Rich Ullery, NF7D, or Teresa Ullery, N7MTN, you read about their TacPacks™ here in *CQ*, and also ask about their neat MP-1 Super Antenna cases and LED flashlights that shine in color to avoid dilating your eyes at night. Everybody needs at least one of them!

New Communication Outfitters Expedition Pack

Another new case designed to carry everything "backpack" or "pedestrian mobile" style is the Expedition Pack from Communication Outfitters shown in photos 3 and 4. The pack is designed to carry a Yaesu FT-817 and LDG antenna tuner in its upper middle section, one or two fair-size battery packs in its lower middle section, plus various cables and screw-together MP1 or MP2 Super Antenna sections in its zippered pockets. Velcro loops beside the middle section and a flap-covered top cutout are arranged to hold/support a fully extended MP1, MP2, "Walkabout," or "Joey" antenna for pedestrian mobile operations. You just slip the whole pack on your back (it has fully adjustable straps), pull a key and mic (or a Heil HS-10 headset) over your shoulder, roll out a trailing counterpoise wire, and start walking and talking. Well, it's almost that easy.

The SWR will vary noticeably as you walk in different areas, so including a "One Touch Tune" module from <www.w4rt.com> (featured in a past "QRP" column) will help ensure everything works smoothly. Say backpacking or hiking through the wilderness is not your vision of fun? No problem. The Expedition Pack is still a perfect way to store and transport a complete, ready-to-operate setup for vacationing, impromptu mobiling, or emergency preparedness.

Remember the last time you quickly packed for such an adventure? One trip to the car with the rig, mic, and some antenna pieces . . . oops, you forgot the antenna base; oops you forgot the coax and paddle; oops you forgot the tuner; and oops; and oops. What a challenge! It is really nice (a blessing!) to have everything neatly packed "Rambo-style" and ready to roll in an Expedition Pack.

The pack's main shell is reinforced to hold its shape and protect your prized gear even when dropped or squeezed into a tightly packed car trunk. Inside the pack, zippered sections are heavy-duty nylon, and transceiver/tuner sections are padded nylon with open areas for cable access plus nylon "slings" for easy removal of gear.

As of this writing, Communications

Photo 5– Rhonda Comer, KG4FVL, the "Ham Goddess," gives us a cool-going outback-size comparison of Terlin's new Joey all-band portable antenna. The little beauty stands 4 feet tall and has a black 30 inch shaft and a stainless 20 inch stinger. It is imported from Australia by Alpha Delta Communications, Inc. and is available from amateur radio dealers nationwide. (Photo courtesy Tony Comer, K4KR)

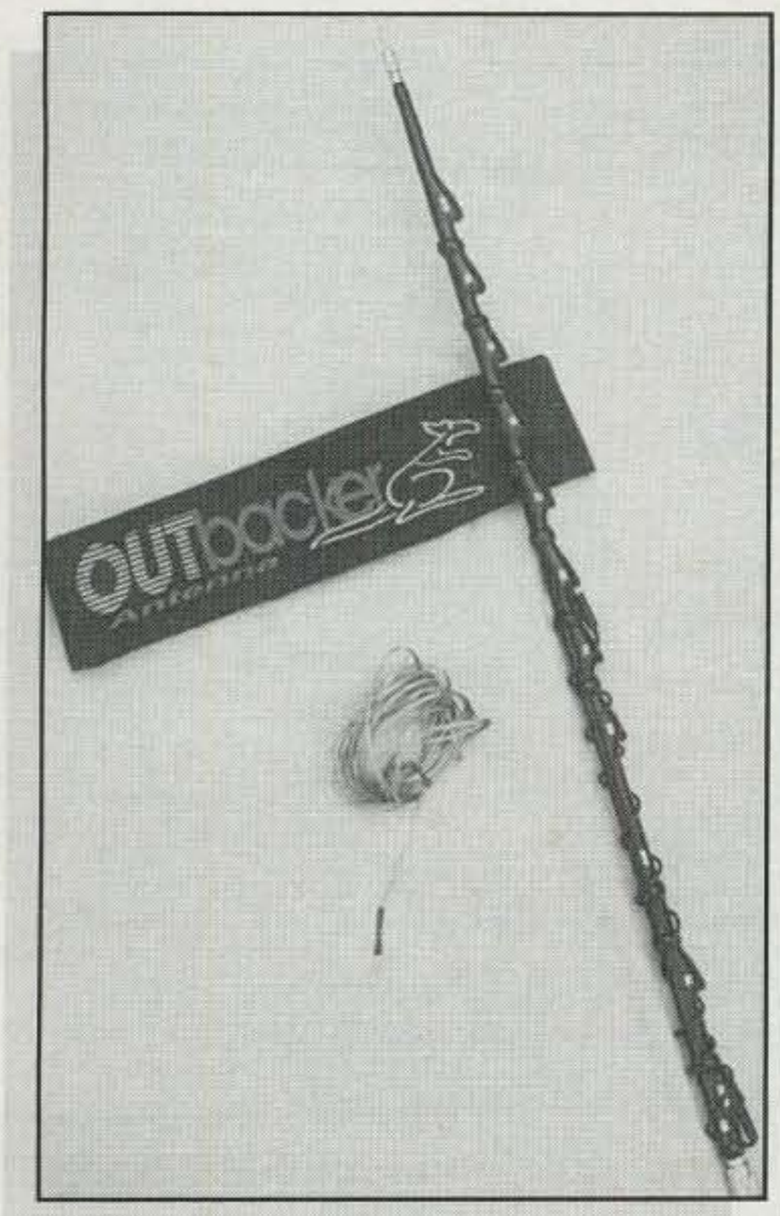

Photo 6–A second look at little Joey with its black felt pouch and copper counterpoise. Antenna covers 80 through 2 meters, including the WARC bands and 6 meters. Included carry pouch is a genuine souvenir from Australia and a real attention grabber suitable for hanging on a shack wall.

Outfitters was also developing a new universal Expedition Pack for the Yaesu FT-100, VX-1210, or ICOM IC-706 transceiver. Contact Communication Outfitters at 3450 Palmer Drive, Suite 4-317, Cameron Park, CA 95682; 530-672-6176 or <www.communication-outfitters.com> for more details.

Little Joey's A Romper!

As predicted in our last column, another big-name company recently joined the mini-HF antenna market—Terlin of Australia. It looks as if this manufacturer of the popular Outbacker mobile antenna is ready to capture the limelight with its new 4 foot tall "Joey" shown in photos 5, 6, and 7.

The new Joey (named for the baby kangaroo "down under") is being imported by Alpha Delta Communications, Inc., P.O. Box 620, Manchester, KY 40962; telephone 1-888-302-8777 or <http://www.alphadeltacom.com>. It is available from dealers nationwide. It covers 80 through 10 meters, including the WARC bands, plus 6 and 2 meters. Joey sports a 30 inch lower shaft with

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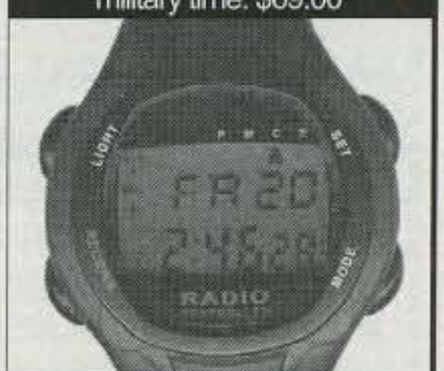

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Looking Ahead in CQ

Here are some of the articles that we're working on for upcoming issues of *CQ:*

• " 'Top-Band' Path-Switching, Part 2," by VK6BZ, VK6HD, and NM7M

• "*CQ* Market Survey: HF (and HF/VHF/UHF)Transceivers," by WB6NOA

• "Cool Christmas Goodies," by WB6NOA

• "Build a Station Controller," by AF1US

Plus:

• "Add Scanning to Converted CBs," by WB9YBM

• "Transforming a Transformer," by VE3ERP

Photo 7– Alpha Delta's optional MicroMount for little Joey lets you quickly mount the antenna on a deck, desk, or rail. After use, it folds into a 2" × 8" package you can carry in a pocket. (Details in text.)

familiar Outbacker-type band sockets and movable "wander lead" and a 20 inch upper stinger that retracts into the shaft section for carrying or storage. The complete antenna weighs less than a pound, handles up to 20 watts, and is fitted with a PL-259 connector in its base. An SO-239–to–PL-259 right-angle adapter (83-1AP) is included with the Joey, so it can plug right into the antenna socket of an FT-817, SG-2020, K2, or a Yaesu FT-100, ICOM IC-706,or Kenwood TS-50 set at 10 watts output. A flexible 16 foot copper-braid-type counterpoise wire is also included in the Joey package to synthesize ground and ensure smooth operation in various environments, and an optional 16 foot × 3 run RK-3 counterpoise/radial kit is available for "deluxe" installations.

An optional MicroMount tripod that folds up to a 2" × 8" pack for traveling is also available for supporting the Joey on a deck, picnic table, or even a condo's balcony rail with its attached Velcro strap. The mount tilts to any angle, is remarkably strong, and has sockets for the antenna, coax feedline, and a wing nut for securing the counterpoise. It is the neatest thing and a gem for portable work.

Surely the biggest asset little Joey has going for it is the way Terlin pre-tunes its band taps for resonance around most-used frequencies during production. Assuming use of the supplied counterpoise to reproduce those factory tuning conditions in the field, changing bands is usually simplified to just moving the wander lead. I say "usually" because unlike shorter wavelength 2 meter antennas, any and all nearby objects affect HF antennas, and small antennas such as the Joey are prime candidates

Photo 8– My 30 meter Isotron mounted atop a few slip-together TV masts strapped to a back desk adds real ham "class" to the house. The little antenna measures only 22" × 16"W × 15"D, but works out well. Isotrons for 40 and 80 meters look similar to this 30 meter version.

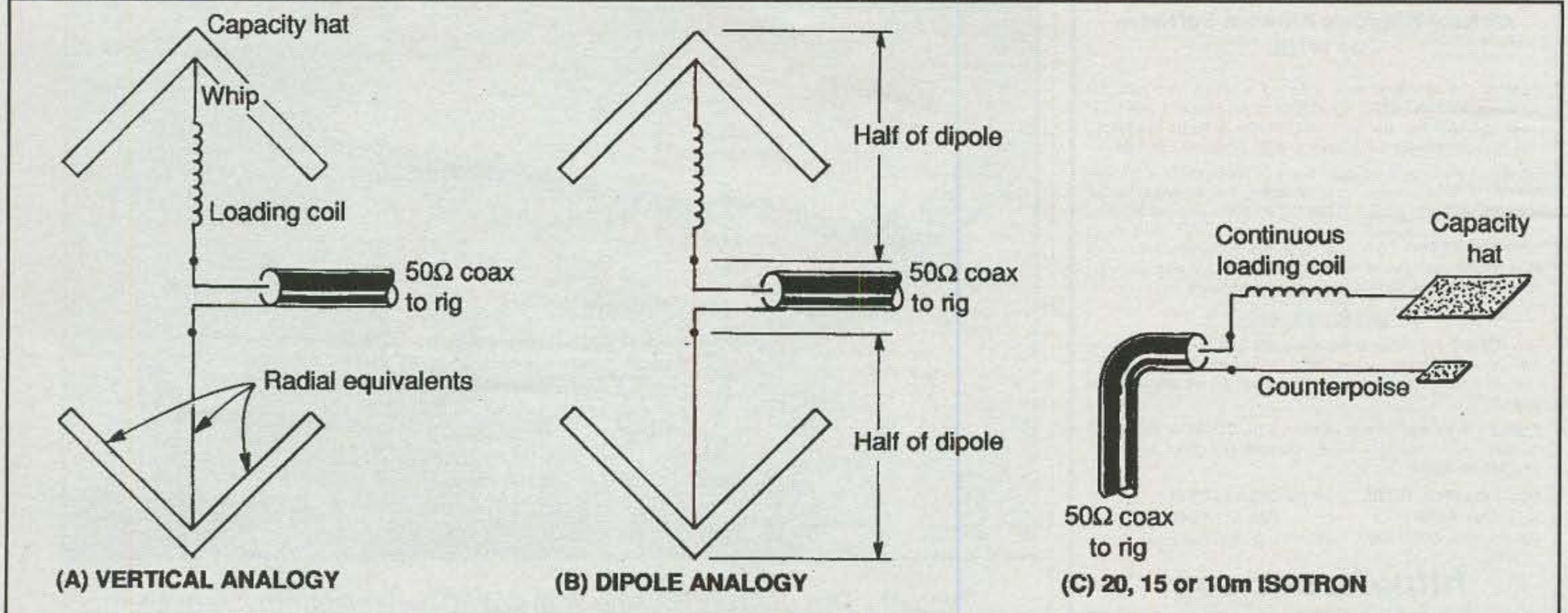

Fig. 1– Simplified outline of how Isotron antennas radiate signals. (Discussion in text.)

for squeezing into tight places that make any antenna's SWR soar.

So how does little Joey rate in general performance? Quite well for its size, and almost equal to a regular mobile Outbacker, I would say. Joey's main attraction, however, is its exceptional portability. Like a typical over-enthusiastic amateur, I first checked out Joey by grossly abusing its portability. Rather than setting up my traveling QRP station in a clear area or outdoors on our deck, I put Joey (and MicroMount) amidst furniture in the den and strung its counterpoise down the hall and into a bedroom—totally ridiculous. Surprisingly, the SWR checked out at 1.2:1 on 14.260 MHz. Still doubtful that my "motel room mockup" could work, I tuned the band and even contacted a couple of stations in the Caribbean—on SSB, no less.

The next week I loaned the antenna to Rhonda and Tony Comer, KG4FVL

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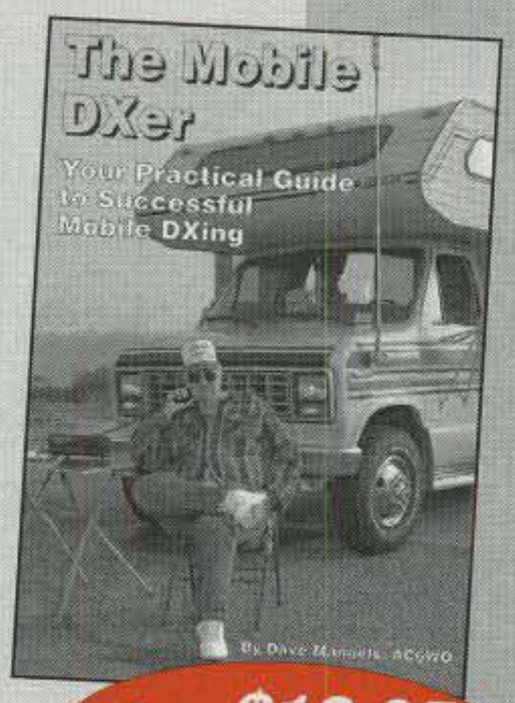

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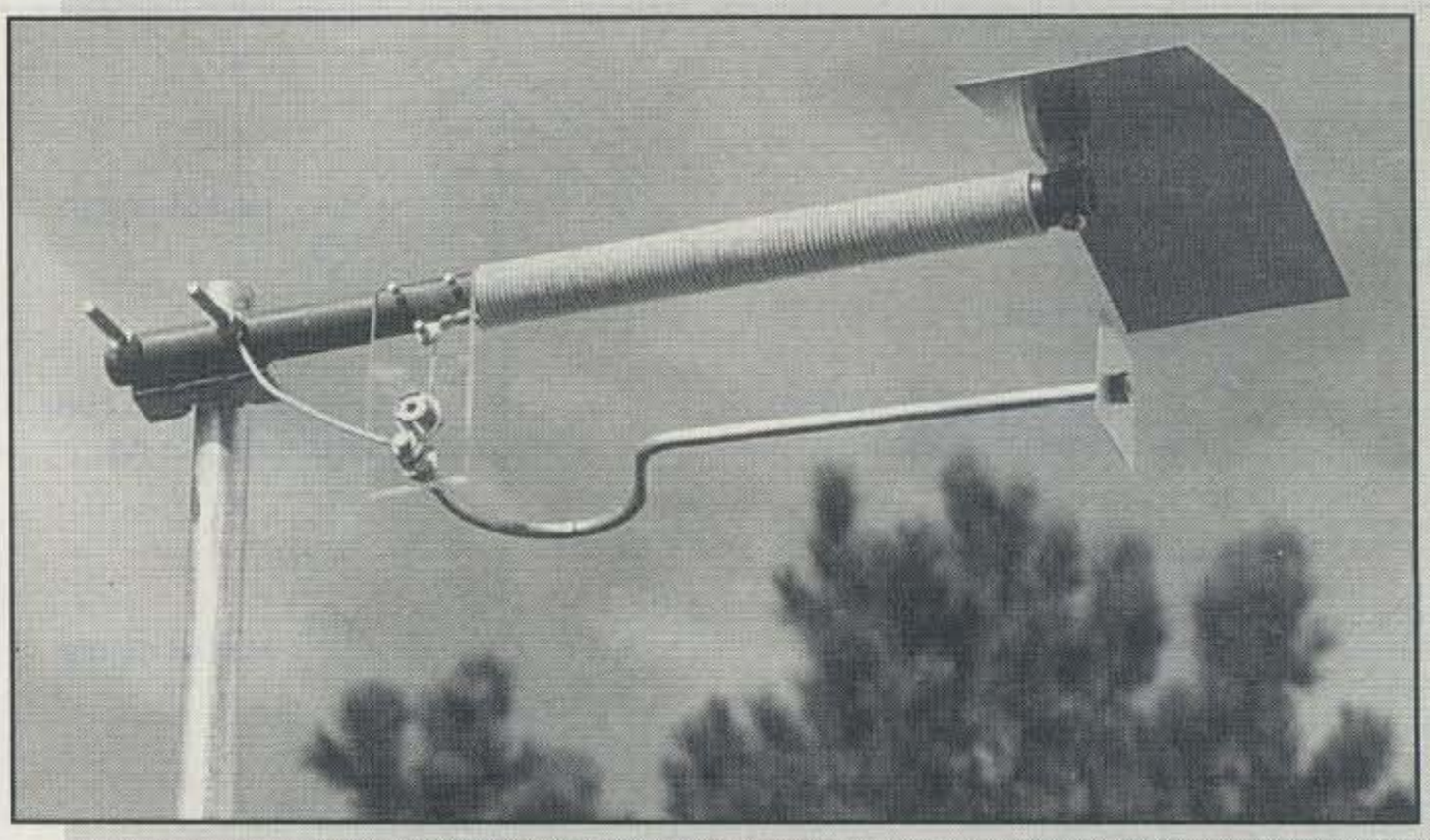

Photo 9– This unusual-looking item is a 20 meter Isotron. It is quite small and would look great towering above a backpack or mounted atop a flag pole attached to a house. It would even make a low-profile mobile antenna when mounted on a composite-body vehicle. (Photo via Ralph Bilal, WDØEJA)

and K4KR, for the "Ham Goddess" photo shoot. Tony worked several stations on 17 meters with it and his FT-817 sitting on his kitchen bar—again indoors. We concluded that Alpha Delta has another winner in its new Joey. It is one rompin' little radiator!

Classic Isotron Still Popular

Taking a cue from low-profile apartment dwellers, a number of amateurs are checking out Ralph Bilal's time-proven Isotrons for ultra-light portable and even pedestrian mobile-type operations. Judging from my own success using a 30 meter Isotron for home and "stationary portable" operations (photo 8), I would say the idea holds merit. The thing is small enough to carry on a car's rear seat, and it can be installed almost anywhere.

The Isotron is a reasonably good low-noise antenna suitable for outdoor installation (it looks cool enough to be modern art), and it is quite capable of

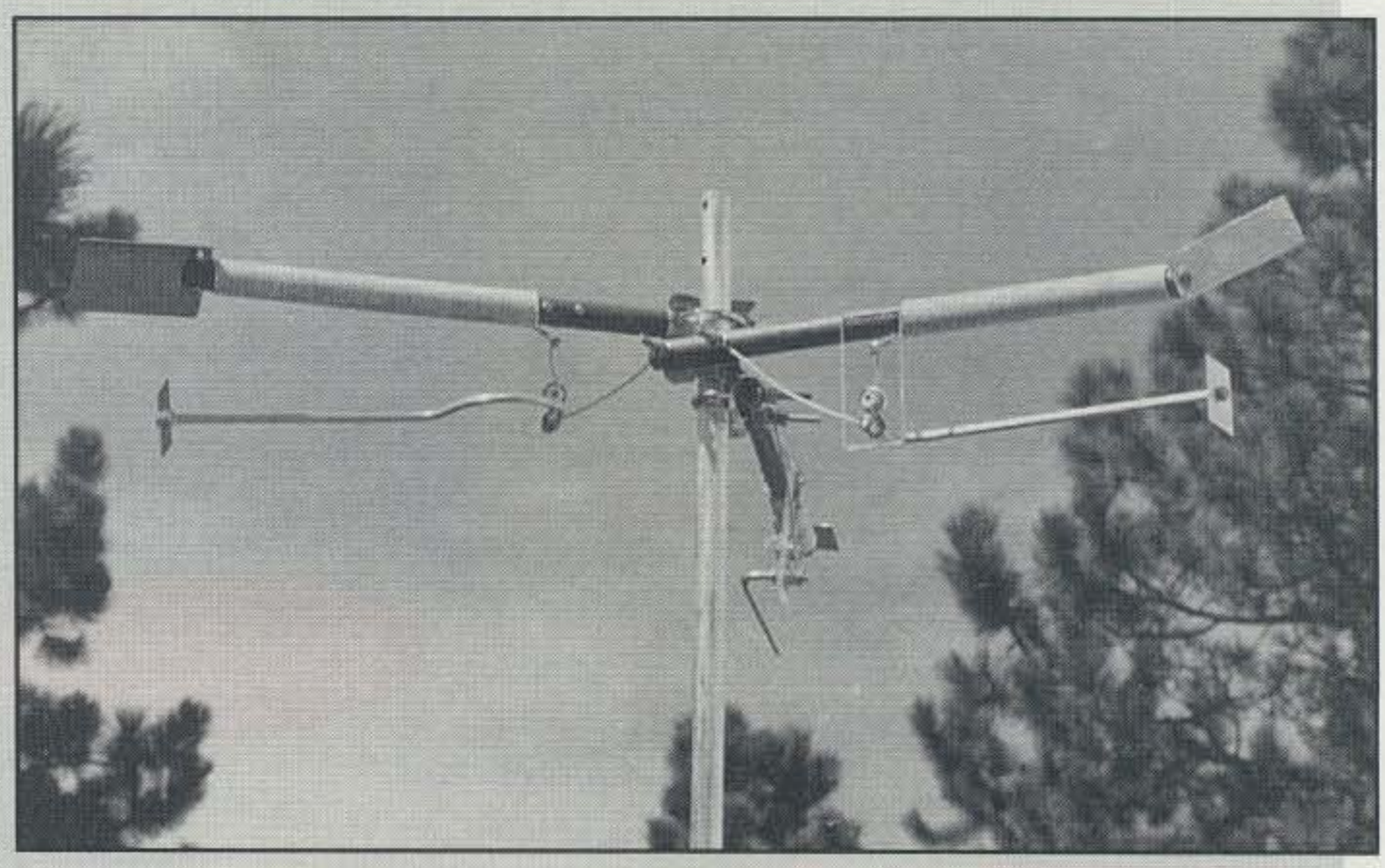

Photo 10– New-style helicopter blades? No, it is an Isotron Tribander! Here you see Isotrons for 20 meters (left), 15 meters (right), and 10 meters (forward) mounted to a TV mast and ready for portable or emergency operation from almost anywhere.

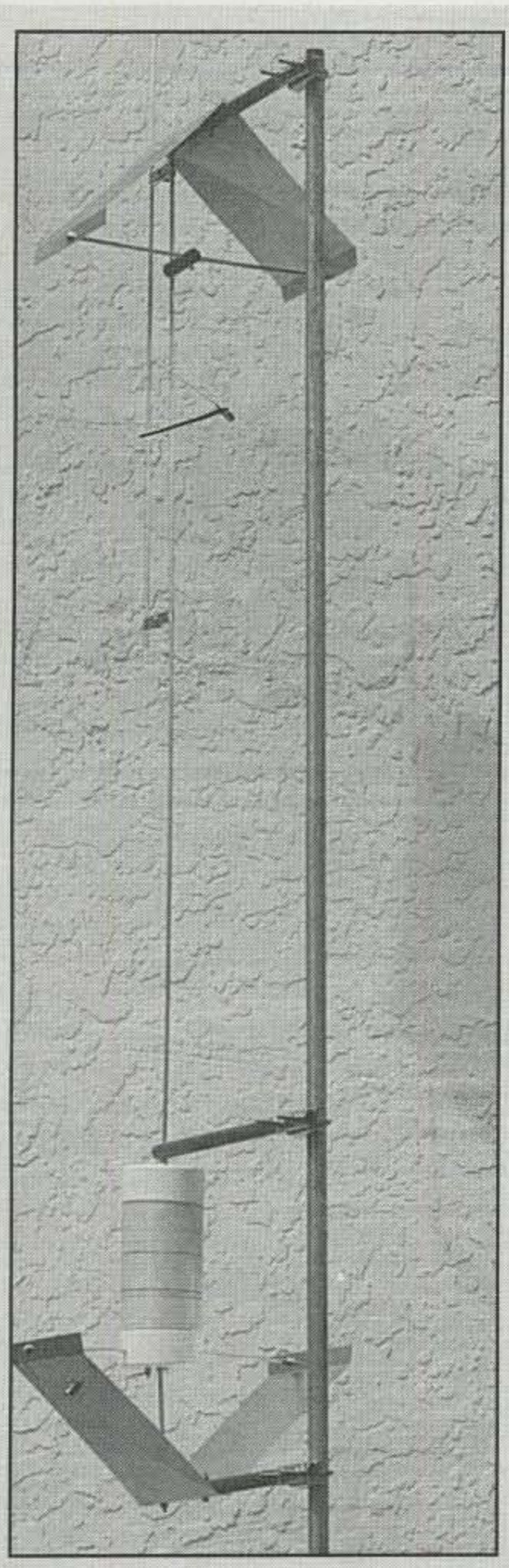

Photo 11–A high-rise birdhouse? No, it is a 160 meter Isotron! It measures 9.5'H × 15"W × 15"D and puts "top band" capabilities within reach of almost everyone.

surviving the elements. It is also ideal when you want near-dipole performance, but do not have the time and/or space to install a full-size dipole. You just mount one (or two or three!) on a pole, strap the pole to a deck rail, and you are ready for action (photos 9 and 10). Like to give "top band" a go from some off-the-wall location? Check out the 160 meter Isotron shown in photo 11. Just tell leery critics it is a new-style winter feeder for tall birds, and ham it up. Ah, amateur radio life is grand!

So how does an Isotron radiate signals? The full story is a mite complex, and it can also be described from the similar-to-dipole or from the similar- to-vertical standpoint. I will use my classic-style 30 meter version (which is similar to a 40 or 80 meter version) as an example and streamline the main details. Refer to fig. 1 as we proceed.

As a vertical, the aluminum "V" section at the bottom acts like radials or a counterpoise, and the center loading coil plus its upper rod and top "V" section act like a tall whip with a big capacity hat at its top. Everything radiates here—even the coil's lower support rod, which acts like part of the counterpoise. As a dipole, the coax shield connects to the bottom "V" section to simulate one "side," and the center conductor connects to the coil and top "V" section to simulate the other "side." Again, everything radiates—and in both vertical and horizontal planes. The overall design is quite clever. It presents a 50 ohm load to a transceiver just like a regular antenna, accepts regular 50 ohm coax, and does not require an antenna tuner for operation.

Oh, yes . . . A 20, 15, or 10 meter version of the Isotron is shown in fig. 1C, and it also can be compared to a vertical or a dipole. Just visualize the upper section as a continuously loaded whip with a large-surface-area capacity hat, and the lower section as the counterpoise for a vertical. As an alternative, visualize the upper and lower sections as each half of a dipole.

The design and appearance of Isotrons may seem unusual, but they must work. Amateurs worldwide have been buying and using them for over 20 years—a true American success story for sure. Want to try one? Write to or call Ralph Bilal, WDØEJA, at 137 Manchester Dr., Florrisant, CO 80816; telephone 719-687-0650; or on the web at <http://www.rayfield.net/isotron>.

Wrap Up

Whoa, Nellie! Once again we have overflowed available space and I am now the one saying "oops." Ah, but there are still more new goodies and ideas standing by to be highlighted next time, and my new book *Ultra Light HF'n: Portable Fun and Survival Ready* ($16 plus $3.50 Priority Mail) should be ready to debut at that time. Everything is looking grand, so stay safe and stay tuned!

73, Dave, K4TWJ

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Contesting

BY JOHN DORR, K1AR

News/Views Of On-The-Air Competition

Have We Seen the Best of Contesting?

February's Contest Tip of the Month

Sometimes doing the obvious is not the right operating strategy in contesting. For example, this fall we suffered through a hideous solar flare during the CW weekend of the CQ WW Contest. As it turned out, one of the best times to take an off-period was when many normally would have been running stations at super-fast rates during the morning runs to Europe. The problem was there was no Europe! Being flexible and searching for the obscure is a great way to approach contesting. Good advice is never get in a rut; taking unconventional routes is sometimes the right thing to do!

Calendar of Events

Jan. 19	LZ Open Championship
Jan. 19-20	North American SSB QSO Party
Jan. 19-21	ARRL January VHF Sweepstakes
Jan. 20	HA DX Contest
Jan. 25-27	**CQ WW 160 Meter CW Contest**
Jan. 26-27	UBA SSB DX Contest
Feb. 2-3	Vermont QSO Party
Feb. 2-3	New Hampshire QSO Party
Feb. 3	North American SSB Sprint
Feb. 9-10	Dutch PACC Contest
Feb. 10	North American CW Sprint
Feb. 16-17	ARRL CW DX Contest
Feb. 23-24	REF SSB Contest
Feb. 23-24	North Carolina QSO Party
Feb. 22-24	**CQ WW 160 Meter SSB Contest**
Mar. 2-3	ARRL SSB DX Contest
Mar. 10	Wisconsin QSO Party
Mar. 10	North American RTTY Sprint

Let's face the facts: There are a lot of pessimistic comments about the future of our hobby being thrown around ham radio circles these days. With the average age of the typical ham getting up there in years, there may be some justification for these concerns. Of course, there also are the other factors we keep hearing about: the internet, cell phones, computer games, etc. The world is now affordably available to our fingertips.

Have you walked through a consumer electronics store lately? It's particularly interesting to look at the computer-gaming section of a typical store. This may not surprise you, but it sure doesn't look like a Dayton Hamvention® hospitality room. The average age of the shopper is probably 15 years old, dominated by a group of youngsters who have at least as much enthusiasm for their computer sport as we did for ham radio in our youth. There are some kids who have as many internet friends around the world as we know hams. Yes, fellow contester, we have serious competition indeed.

Well, now that I've gotten you to the point of perhaps wanting to sell your equipment while there's still a marginal market of buyers available, let's shift gears and focus on an attribute of contesting that's very curious, especially in light of my earlier comments.

Why is it that in a period of seemingly stagnant or declining growth we continue to see contest scores escalating? With this escalation have we, in fact, seen the best of contesting? After all, by most popular measures we have established that the population of available HF contesters is declining. With the average age of hams rising, isn't the number of "contest hours" operated by a typical competitor less than ever before? It seems that we have all of the ingredients to witness a *decline* in overall scores, not an *increase.* That should translate into an overall decline in contest interest and perhaps the conclusion that we have indeed seen the best. However, all you need to do is flip on the radio in any reasonable-size contest and your receiver will be filled with operators across the bands. Whether it's the CQ WW, a 160 meter contest, or the ARRL Sweepstakes, the bands are alive with the sound of contesters, as Julie Andrews might have said if she was a ham.

Well, I believe there are a number of factors to consider here. For starters, let's be thankful for that big, yellow disk in the sky we call the sun. While its brightness never wanes, its impact on propagation certainly does. Thankfully, too, more than ever ham radio needs an infusion of good conditions to spark our hobby. In recent years good conditions have been delivered in spades. What was once a dead 10 meter band is now one which makes finding a clear frequency a challenge anywhere from

2 Mitchell Pond Road, Windham, NH 03087
e-mail: <K1AR@contesting.com>

28300–28700 kHz in many contests. Even though we've seen the peak of this cycle, this contest season is still delivering extraordinary conditions. (We conveniently will forget the first day of the 2001 CQ WW CW Contest, won't we?) Even small pistols are enjoying contesting again. For example, I remember a 1200 QSO part-time effort in the 2000 10 meter contest while operating from my home QTH with an 80 meter dipole in the trees and only 100 watts. As with club scores and many other areas, small pistols are the key to the contesting kingdom. Without them there are no contests. Quite simply put then, good conditions make for more guys (and gals) to work—period!

Another factor to consider is the improvement in equipment, especially overseas. It certainly can't hurt scores now that more operators have better equipment to use when operating. That not only makes them more accessible to serious contest operators, it increases *their* interest so that they operate more hours in a given contest. The result—higher scores. With higher scores comes increased interest in contest operating by everyone.

Yet another aspect of this discussion has to do with the number of available stations to work. Now this may seem contradictory to my opening points, but while amateur radio growth in general is declining, there are pockets of seemingly dramatic increases. You can determine this in many ways, but an obvious one to think about is a country's newly issued callsigns. Consider what is happening in countries such as England (with the MØ block now nearly fully subscribed) and Germany (Yes, there is a hoard of new callsigns out there.). There are plenty of other examples around the world, too. To be fair, some of this callsign jockeying is a result of local "vanity" programs, but there's no denying that many countries are seeing an influx of new HF operators. For those competitors who benefit most from the availability of Europeans, these new fellows are a boon to contest scores. When combined with other hot spots such as Argentina, Japan, Italy, and still others, the picture may not be as bleak as we think.

Finally, it's apparent that the quality of operating is increasing, too. There once was a day when I was concerned about setting my keyer speed too high. Would I miss out on stations calling me because I was sending too fast? Now admittedly, coming from an East Coast perspective we can't send fast enough at peak-rate times. The volume of quality operators has markedly increased for sustainable periods. This translates into higher rates and higher scores. In fact, it's become a disappointment in my part of the country if your peak rates on CW are less than 180–200 per hour. Obviously, something is drastically wrong.

A quality piece of operating gear on the other end doesn't hurt contest scores either. I would add that this is not just a CW issue. SSB rates have climbed to staggering levels as well. The fact is there are just more stations to work on any mode, in any contest, at any time of the year. I would add that this is true for both DX and domestic contests. (Take a look at the ARRL Sweepstakes results if you doubt me.) That's good for us and great for the hobby in general!

What can be concluded here? As active participants in our hobby, we certainly have cause for concern about its future. However, there are ways to measure activity and interest, and fortunately one of them is contest operating. Contesting has a lot of gusto and momentum. It has always been an aspect of amateur radio that many hams have dabbled in. Why? Because it's not difficult and it addresses the interests of most hams, whether their focus is on DXing, station performance, or just wanting to make an intriguing QSO.

Have we seen the best of contesting? I don't think so. We may be in for a tough stretch as conditions decline, but I remain cautiously optimistic that we'll be back for another day, and believe me, this cycle is hardly over. Don't miss out on the fun and the challenge by folding up your contest tent. You'll regret the fact that you did!

Final Comments

Well, that's all for this month. As some of you may have noticed, it's getting to be that time of the year to run another *CQ* Contest Survey. Keep an eye out for the 2002 edition over the next month or two. As in recent years, there will be special emphasis on making the internet a primary method of submitting your survey responses.

73, John, K1AR

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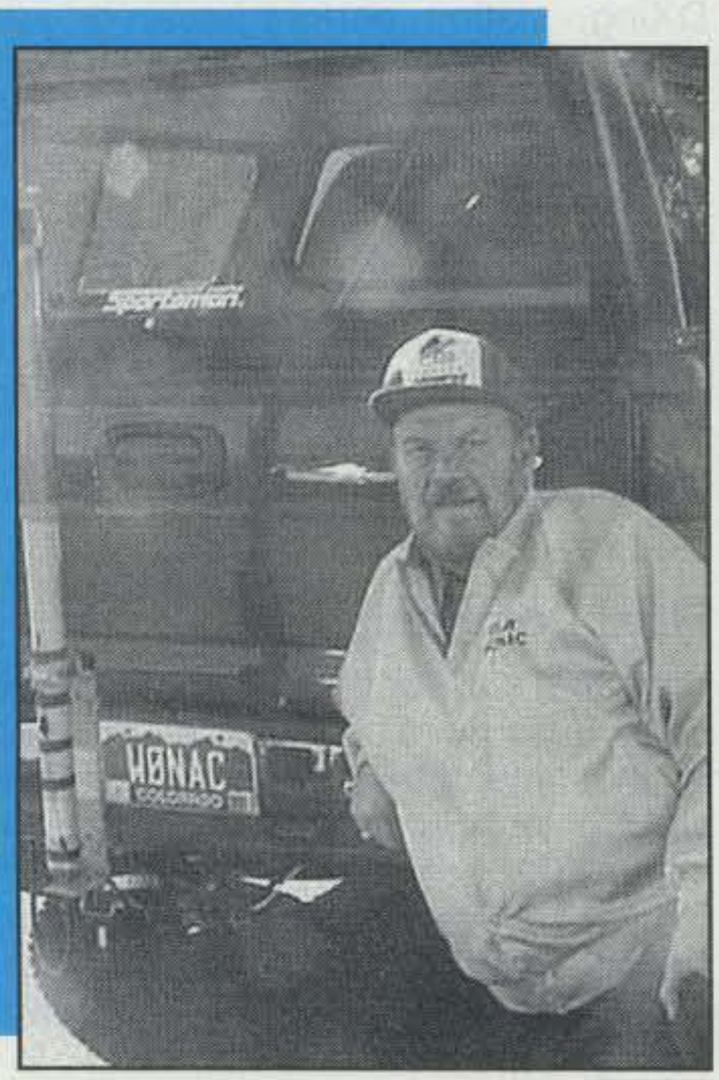
Awards

BY TED MELINOSKY, K1BV

News Of Certificate And Award Collecting



Robert Matthew, WØNAC, USA-CA All Counties #1032.

In addition to answering a question about USA-CA and covering some awards available from around the world, first we hear from Robert E. Matthew, WØNAC, USA-CA All Counties #1032, October 9, 2001.

It was serendipity that I got my USA-CA Award on the 9th of October 2001, which was also my 69th birthday. The number of my award (1032) also corresponds to the month/year of my birth! What a happy turn of events.

I got my first license in about 1948 while still in high school. I built my first transmitter using an 815 tube for the final, and my folks gave me a Hallicrafters SX-43 for my birthday. It seems that it was near the peak of the sunspot cycle, and I had a great time working stations on 10 meters from my "shack" in the backyard built out of old ammunition boxes and which had a potbelly stove to keep me warm. All of this took place in Rocky Ford, Colorado, where I was born. I remember with great fondness the many Elmers I had during those years.

I completed two years of college before joining the Air Force in 1953. I finished Aviation Cadet pilot training in 1955 and was stationed many different places around the world, including Bitburg AB in Germany, where I held a DL call for a couple of years. I served in southeast Asia (Thailand) as a Wild Weasel pilot flying the F-105 Thunderchief for 100 missions over North Vietnam. Most of these missions involved hunting and suppressing surface-to-air missiles. There was not much chance for hamming there, except I do remember using the MARS station on base to talk to my XYL via phone patch. I also served two tours at the Pentagon in Research and Development, where I helped get the AIM-9L air-to-air missile developed and also helped get the F-15 and the Space Shuttle off the ground. Along the way I also completed my BSEE and MSEE plus an MBA, all thanks to the USAF. I retired from the Air Force in 1980 and worked for Martin Marietta as a systems engineer until 1990, when I retired again. I now work for myself as a computer consultant/software designer.

Through all of these 50+ years I usually have been active in some aspect of ham radio. I ran across the County Hunters Net around October 1999. After listening for a while, I decided I wanted to put out counties as a mobile station and as they say, "The rest is history!" It took about 23 months to complete my 3076th county and another month to finish collecting all MRCs, etc. Since October 9th I have already logged over 880 counties toward my second-time-around award. Also, over the last two years I have transmitted from about 500 counties, including all counties in my home state of Colorado.

My special thanks to Larry and Rose, W9SUQ and KA9QKN, for finishing many counties for me in Georgia and Kentucky. Kudos to Ken, KC4UG, for giving me my last in Hancock, Tennessee. I also must thank all the other mobile stations, many of which went out of their way to give me counties I needed. Without their help this award would have been 100 times harder to achieve! A special debt is owed to my XYL, Sharon, for her constant support and for being my chief logger and scribe. I love the beautiful award certificate and will keep it on my shack wall with pride. —*Matt, WØNAC*

65 Glebe Road, Spofford, NH 03462-4411
e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll

Richard D. Karl, W3ZUH
USA-CA All Counties #1033
October 26, 2001

June Sim, VK4SJ
USA-CA All Counties #1034
October 27, 2001

Richard Darwicki, N6PE
USA-CA All Counties #1035
November 14, 2001

USA-CA Honor Roll

1500
VK4SJ 1323

2000
VK4SJ 1223

2500
VK4SJ 1145

3000
W3ZUH.....1053
VK4SJ 1054
N6PE.....1055

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 65 Glebe Road, Spofford, NH 03462-4411 USA. DX stations must include extra postage for airmail reply.

USA-CA Q&A

Question: Recently in the Texas QSO Party I operated portable from my RV from five rare counties. I needed all five counties for USA-CA. What is the rule regarding a portable or mobile station getting USA-CA credit for a county it activates? I scanned the USA-CA rules on the *CQ* website, but didn't see anything covering this situation.

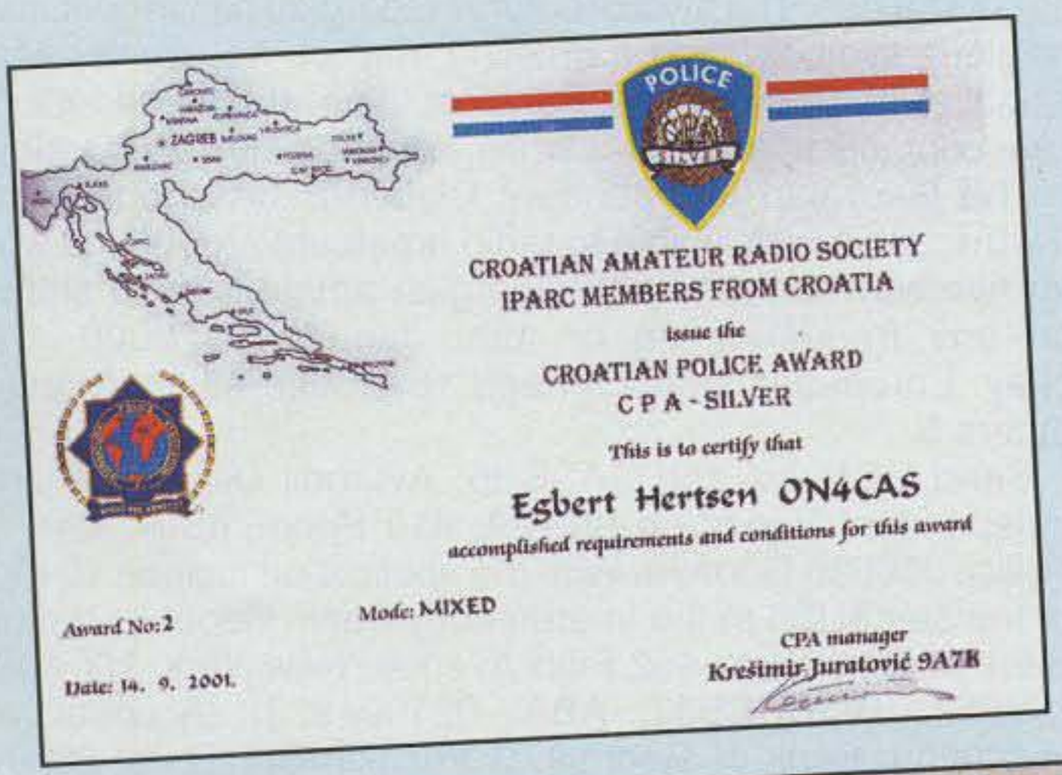
Answer: Some award rules specifically allow the operator of a station to count for the award the locality from which he or she operated. USA-CA does not do this. You must have contacted another station in that county. The best way to do this is to have another licensed operator in the vehicle and a couple of handheld VHF radios to make that contact. There are no restrictions on frequencies or modes used to work counties. It's a good reason to talk the XYL into getting her license!

Awards Available

Croatian Police Award. The International Police Association (IPA) is well known for offering certificates for contacting members. The various branches of the group offer a large collection of certificates from 14 different countries in which the organization is active.

Recently, the group in Croatia has developed an award. It is sponsored by the HRS (Croatian Amateur Radio Association) and issued by Croatian IPA members. It is available to all licensed radio amateurs and SWLs and may be earned for CW, SSB, or Mixed contacts, all bands. Requirements are as follows:

CPA Silver: 100 points = 3 Croatian IPA members + 5 IPA countries



The Croatian Police Award is sponsored by The Croatian ARA and issued by Croatian International Police Association members.

The Savaria Award is issued for contacting HA1 or HG1 Hungarian stations.

The Islands of Croatia Award is available for working at least ten of the hundreds of islands off the coast of Croatia in the Adriatic Sea.

CPA Gold: 500 points = 3 Croatian IPA members + 10 IPA countries

CPA Trophy: 1000 points = CPA Silver and Gold + 15 IPA countries

Each QSO with an IPA member in your own country = 2 points; QSOs with IPA members on your own continent = 5 points; QSOs with IPA members in other continents = 10 points. Club stations count double in each category (4, 10, 20 points, respectively).

Cost of the award: CPA Silver and CPA Gold $US6; CPA Trophy $US30.

A GCR list should be sent to the award manager, 9A7K, P.O. Box 88, HR 48000 Koprivnica, Croatia.

Islands of Croatia Award. Another Croatian award is available for working at least ten of the hundreds of islands off the coast of Croatia in the Adriatic Sea. The 9A fraternity is always very active in every DX contest, and they provide many of the decibel-pounding signals out of southern Europe. You'll work a few new Croatian islands during every Islands On The Air (IOTA) contest.

Contact or provide contacts from islands of Croatia, chasers and activators, respectively. The levels of this challenging award are as follows:

Level	Chaser	Activators
Basic	10 islands	5 islands
Bronze	25 islands	10 islands
Silver	50 islands	20 islands
Gold	75 islands	40 islands
Diamond	100 islands	50 islands

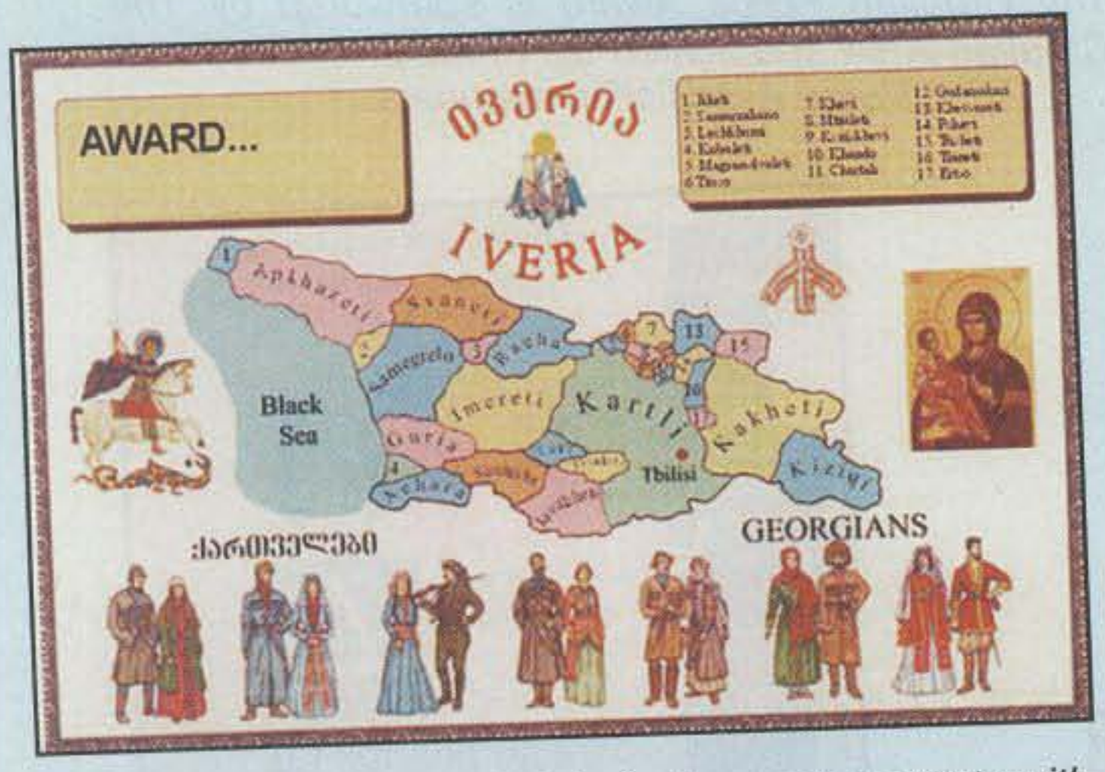
Chasers must submit QSL cards or copies of the cards. Activators must show evidence that they have made a minimum of 25 contacts from each island claimed. Activators may count their activity toward the chaser's award. Contacts must be made from the same country and made since 26 June 1991 on any HF band 1.8 MHz up to and including 50 MHz. Maritime contacts are *not* allowed.

The Islands of Croatia Directory costs $US10, 15 IRCs, or the equivalent and should be used for any application. This price includes the cost of the Basic certificate. Bronze, Silver, and Gold levels cost $US8 (or the equivalent) plus 4 IRCs for QSL return postage. The Diamond plaque costs $US25 (or the equivalent). When applying for the Basic award, applicants should send only sufficient postage for the return of their QSLs, or the cards will be returned via the bureaus if needed. Application forms should be sent to: Croatian Amateur Radio Association, Dalmatinska 12, HR-10000 Zagreb, Croatia; <http://www.qsl.net/9a6aa/>.

Hungary's Savaria Award. Here's a handsome certificate with an old European city motif. Thanks to Egbert, ON4CAS, for submitting samples of this and several other awards which are featured in this month's column.

The Radioamateur Society of Vas county issues this award. Contacts must have been made after 1 January 1976. DX and VHF stations must make 10 different HA1 or HG1 contacts. European stations on HF need to contact 20 different stations from this area. Apply to: Manager, Savaria Radioclub, Puskas T.u.7, Szombathely, Hungary H-9700.

Georgia's IVERIA Award. For a bit more of a challenge, this award from from Georgia (no, not the Peach State) requires five contacts with 4L stations for



The IVERIA Award is available for two-way contacts with Georgian amateur radio stations.

Worked Diploma Interest Group (DIG) members in Switzerland to achieve this award.

The Worked All Great Lakes Lighthouses/Lightships Award commemorates the many lighthouses that stand guard along the shoreline shared by the U.S. and Canada.

us DX stations. The award features Georgian native costumes, religious symbols, and a detailed map of the country which identifies its 17 provinces. For most of us, 4L is semi-rare DX. Five contacts might take a while, but it is definitely possible.

The Georgian Independent Club IVERIA sponsors this award, and it is available to radio amateurs around the world for two-way contacts with Georgian amateur radio stations on any frequency on or after January 1, 2000. SWL okay. Europeans stations need 10 QSOs, Asian 7, and all others 5.

Send GCR list and SASE to: Avtandil Djikia, Manager, Independent Radioclub IVERIA, 418 Room, 48 N. Marr St., Tbilisi, 380036 Georgia. With the application include 10 IRCs, or transfer $US6 to the Intermediary Bank: Republic National Bank of New York, 452 Fifth Avenue, New York, NY 10018 (SWIFT: BLICUSS33, ABA: 021004823); Account with Institution: Bank of Georgia, 3 Pushkin St., Tbilisi 380007, Georgia (SWIFT: BAGAGE22, acc. 608477621). Beneficiary Customer: Jikia Avtandil, Acc No.: 01-394089008. <http://www.geocities.com/shalva4l1br/>

Worked DIG Members in Switzerland. Don't you just love those colorful European awards showing rows of coats of arms and symbolic emblems of olden days? The Swiss chapter of the "Diploma Interest Group" offers one of these for contacting their members. Award hunting is very popular in Europe, and the "DIG" is a German club which encourages and sponsors this part of our hobby. DIG members are usually active in contests, and if you check your QSL collection, it's quite possible that you've received enough of the qualifying members' cards to apply for the award.

Contact DIG members in Switzerland after 16 July 1986. SWL okay. For HF, EU stations need 15 points; DX need 10. For VHF/UHF, all need 8 points. Endorsements are available for all CW, all SSB, Mixed, VHF, or UHF. Send GCR list and $5US, sFr. 7.00, DM 10.00, or 10 IRCs to: Nick Zinsstag, HB9DDZ, Rimattstrasse 7, CH 5084 Rheinsulz, Switzerland.

Members and point value:

3 points – HB9DIG (club station).

2 points – HB9AON, AUT, AWS, BGI, BHY, BIN, BRM, BYZ, CEX, CMW, CRU, CSA, DAX, DDZ, DOD, LW, MIA, MPC, POI, RE, XX.

1 point – HB9ACP, AIJ, ATZ, AZX, AZZ, BHV, BKM, BNQ, BOS, BPV, BQL, BRN, BUQ, CFS, CGC, CMB, CQL, CVO, CXK, DAQ, DDW, DKZ, DLO, DOT, DOV, JAP, JNS, KC, LE, MFW, MHR, MNG, MTL, QA, WNA HE9BVS, GPZ, MYN, ODL, SAA.

USA Worked All Great Lakes Lighthouses/Lightships Award. Showing a handsome satellite image of the Great Lakes (Erie, Ontario, Michigan, Huron, and Superior), this award commemorates the many lighthouses *(lighthouse denotes either lighthouse or lightship—ed.)* that stand guard along the shoreline shared by Canada and the U.S. The website provides lists of eligible lighthouses and also has a copy of the required application. A good time to look for qualifying lighthouses is during the summer lighthouse QSO party.

Contact 15 lighthouses from each state and province bordering the Great Lakes of the U.S. on or after 1 July 2000. Following the basic award, there are endorsements in increments of ten. SWL okay.

a. Work one lighthouse from each state and province that touches the Great Lakes and that has a lighthouse on the Great Lakes—New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, and Ontario (nine contacts). The following bodies of water do not count for this award unless the light is located where these bodies of water meet one of the five Great Lakes: the St. Lawrence River, St.

Marys River, St. Clair River, Detroit River, North Channel, Lake St. Clair, and Georgian Bay. To claim a lighthouse as an "activator" you must meet the requirements of the Amateur Radio Lighthouse Society and include a QSL from the operation.

b. Work one additional lighthouse from each of the five Great Lakes (5 contacts). Again, the lighthouse must be on the Great Lakes . . . and

c. Work one additional Great Lakes lighthouse, for a total of 15 needed contacts.

For the endorsements, you must first have earned the Basic award and submit proof of contact with an additional ten different Great Lakes lighthouses. Fee for the Basic award is $US5; cost for all subsequent endorsement seals is $US2. Confirmations (QSLs) and application form must be submitted to: Ted Sarah, W8TTS, 239 Bermont Ave., Munroe Falls, OH 44262. Photocopies of QSL cards are permitted, but if actual cards are sent, send sufficient postage for their return.

The application and lighthouse lists are found on: <http://home. neo.rr.com/tsarah/www/waglll_Award_Rules.html>.

Internet Site of the Month

The YLRL website has a neat link to a collection of YL-oriented awards. There are 16 of them on this page, most of them linked to another page which contains the full details and rules from the sponsoring organization. Try: <http://www.qsl.net/ylrl/certificates.html>.

I'm still looking for samples of your club or group's awards program. We'll take it from there.

73, Ted, K1BV

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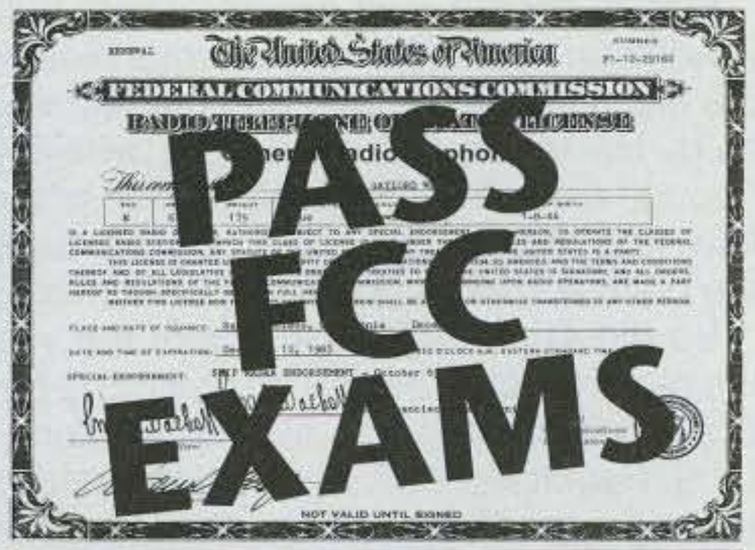

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Radio Classics

BY JOE VERAS, N4QB

Vintage Gear and Its History

The Glass Menagerie

About the title of this month's column: credit and apologies to Tennessee Williams. As I dug through several boxes of old tubes bequeathed to me by a longtime ham friend recently departed for a place with perpetually good propagation and no QRM, the name of Williams' play and the idea for this edition of "Radio Classics" came to mind simultaneously.

In the early years, much of radio technology seemed to move at the same pace as the development of what we in America call the *vacuum tube*. The United Kingdom and other countries use the marvelously descriptive term *valve* for the same device. Its invention possibly occurred earlier, and more accidentally, than one might suspect.

Even after Thomas Edison perfected his incandescent light bulb in 1879, certain things about the device continued to intrigue him and stir his curiosity. One of the chief hurdles he overcame in developing the bulb was extending the lifespan of the filament. Now that it burned for a reasonable period of time, he noticed a thin, dark line in the same plane as the filament always developed on the inside of the lamp's glass as the bulb aged. When the filament finally did burn out, Thomas A. observed it uniformly did so at the negative-connected end (Edison's lamps were DC-powered.). With these two facts in front of him, he went on to conclude that an unseen current flowed within the bulb!

Edison constructed a special light bulb to test his theory. In addition to the filament, a metal plate was mounted inside the glass envelope, with an attached wire leading out of the bulb. He found that when the wire lead was connected through a meter to the positive side of the filament, a current flow was indicated. He also noted no current flowed when the plate was connected to the filament's negative side.

So did Thomas Edison invent the vacuum tube, or even the rectifier? Not really. The device he patented had no practical application; it was filed as a future, just-in-case patent (*U.S. Patent No. 307,031; 1884*) and forgotten. As far as rectifiers go, the Great Man had no need for them. You see, he believed in an all-DC, commercial power distribution system! The phenomenon he observed has been known ever since as the *Edison Effect*, however, and remains an important part of basic vacuum-tube theory.

By the time the vacuum tube actually did get around to being invented, the electric lamp was a common thread in its story. Perhaps this is where the cartoonist's device of having a light bulb pop on over someone's head when he gets a good idea originated. I don't know.

In the same year Edison filed his no-practical-value patent, he was visited by John Ambrose Fleming, a scientific adviser to the Edison & Swan Light Company in the United Kingdom. The purpose of Fleming's visit was to discuss the problems of electric light distribution. If Edison's experiments with the light bulbs + plate ever came up in conversation, neither man mentioned it later.

Fleming *did* find out about Edison's work through a third party, William Preece, Chief Engineer for the British Post Office. Edison had given Preece a few of the experimental bulbs, which he then passed on to Fleming. Eager to duplicate Edison's work, as well as perform experiments of his own, Fleming had Edison & Swan manufacture a number of similar bulbs. Again, with the experiments completed and data collected, the work was filed away under the category of scientific curiosity and largely forgotten.

Photo 1– The 4-1000 serves as a reminder that the vacuum tube is still king in legal-limit amateur power amplifiers. (Photos by Joe Veras, N4QB)

Fleming and Edison shared something else that would lead to the eventual development of the vacuum tube, or at least the first practical diode. It had nothing to do with electricity or light bulbs, but with the fact that both men were almost completely deaf. In 1899 Fleming joined the Marconi Company as an adviser, and when the company began transatlantic wireless tests in 1901, he knew he had to find a better detector than the coherers then in common use. For a man who was hard of hearing, Fleming believed an ideal device would detect the weak currents in the receiving antenna, then provide a visual, rather than aural, indication of the signal. He thought back to the properties demonstrated by the experimental bulbs a decade-and-a-half earlier.

The question now was whether the rectification properties demonstrated by those bulbs would work at radio frequencies. At Fleming's direction, Edison & Swan made a new batch of bulbs. A metal cylinder enclosed the filament and a

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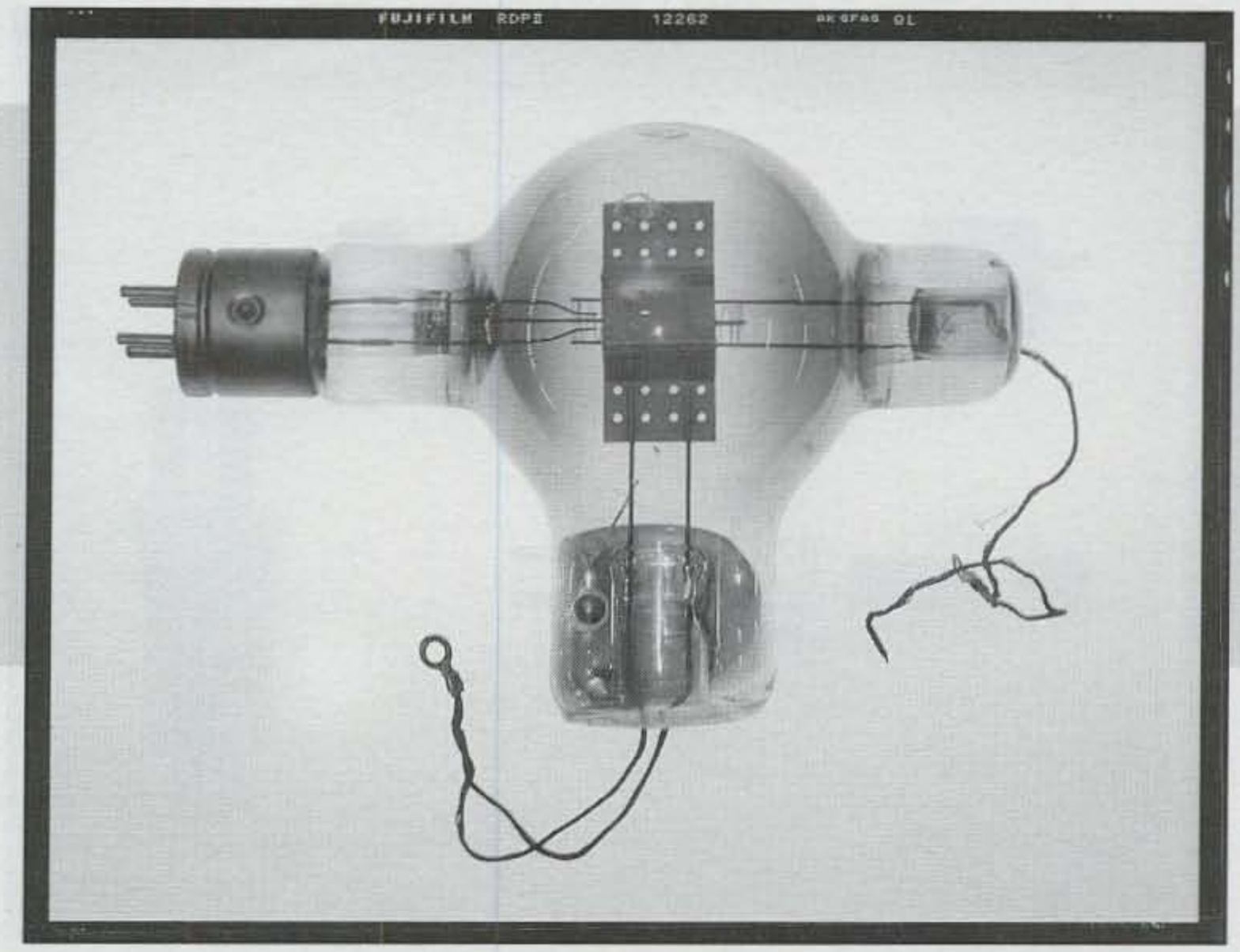

Photo 2– The UX-852 transmitting tube was introduced by RCA in the spring of 1927 as a solution for the amateur seeking a reliable, moderate-power tube useful on the shortwave bands and even at VHF.

wire attached to it led out through a seal in the glass envelope. With the filament illuminated to incandescence and the *plate* lead attached to a headphone or visual indicator such as a galvanometer, Fleming's device was capable of detecting radio waves when connected to a receiving circuit. He called his discovery the *Thermionic Valve*.

British Patent No. 24850 was filed in November of 1904, although it was done so on behalf of the Marconi Company and not Fleming himself, as that was his legal working arrangement with the company. American and German patents followed, but a number of years passed before the new detector supplanted the older devices in use at the time.

On the Continent, German physicist Arthur Wehnelt discovered he could dramatically increase the electron emission from a platinum cathode by coating it with oxides of barium or calcium. These 1903 experiments led to Wehnelt's January 1904 German patent of a vacuum rectifier, slightly predating that of Fleming.

Back in America, Dr. Lee de Forest also sought a different kind of detector, but his motivation differed. The inventor of a wireless telegraphy system, de Forest suffered a legal set-back when the owner of a rival system denied de Forest use of a particular form of detector. Many wireless pioneers held patents closely and were reluctant to license competitors. De Forest went off in search of a detector his system could use without stepping into anyone else's legal territory.

Dr. de Forest eventually wound up with his own version of the thermionic diode. His special twist was the inclusion of a *B* battery in the plate circuit. This 22 1/2 volt battery was not enough to help the inventor achieve his goal of finding a detector free of patent infringement. The Marconi Company prosecuted, feeling its American patent had been violated, but meanwhile Lee de Forest was thinking that perhaps two elements in a tube were not enough.

The early vacuum diodes were not much better detectors than the passive devices they attempted to replace, especially in the sensitivity department. De Forest set out to correct this shortcoming. An answer seemed to lie in somehow introducing a third element into the tube. As a first attempt, he attached the receiver's antenna circuit directly to a piece of metallic foil wrapped around the *outside* of the tube. The dramatic improvement in detection this yielded encouraged him to construct another tube, this time with the third element inside. The additional element, similar in size and shape to the plate, was located on the opposite side of the filament. In this position it is obvious the new element could not have much influence on the flow of electrons between the filament and the plate.

In a subsequent experiment, de Forest moved his third element between the original two and perforated it. Next, he changed the material used for the structure to wire mesh. Each change improved control of the electron stream. Finally, he used a piece of wire bent into a zig-zag shape for the third element, calling it a *grid*. This final iteration produced exactly the result he sought: Lee de Forest had invented the triode!

Still in search of an improved detector, the implications of the triode as an amplifier did not immediately dawn on de Forest. As a matter of fact, the first patent granted (*U.S. Patent 841,387; January 15, 1907*) was for the device having two metal plates on either side of the filament. He applied for a patent on the tube with the zig-zag shaped grid on June 29, 1907, and it was granted on February 18, 1908 (*U.S. Patent 879,532*). Controversy and litigation swirled around Dr. Lee de Forest like a cloud of electrons until his death in 1961.

Tubes from the Early Twentieth Century

Space necessitates leaving behind the story of vacuum-tube development before the second and third grids were added. It's time to return to that box I was digging through at the beginning of the column.

Examining tubes from the opening decades of the Twentieth Century is instructional. One is able to get a visual grasp of how they work. The individual elements are often large and plain to see, right there under glass. A filament in a tube looks much like a reshaping of its distant cousin in a light bulb. The plate looks exactly as if it were meant to catch a stream of electrons and dissipate heat. . . . and the grid? Though the physical structure has varied through the years in

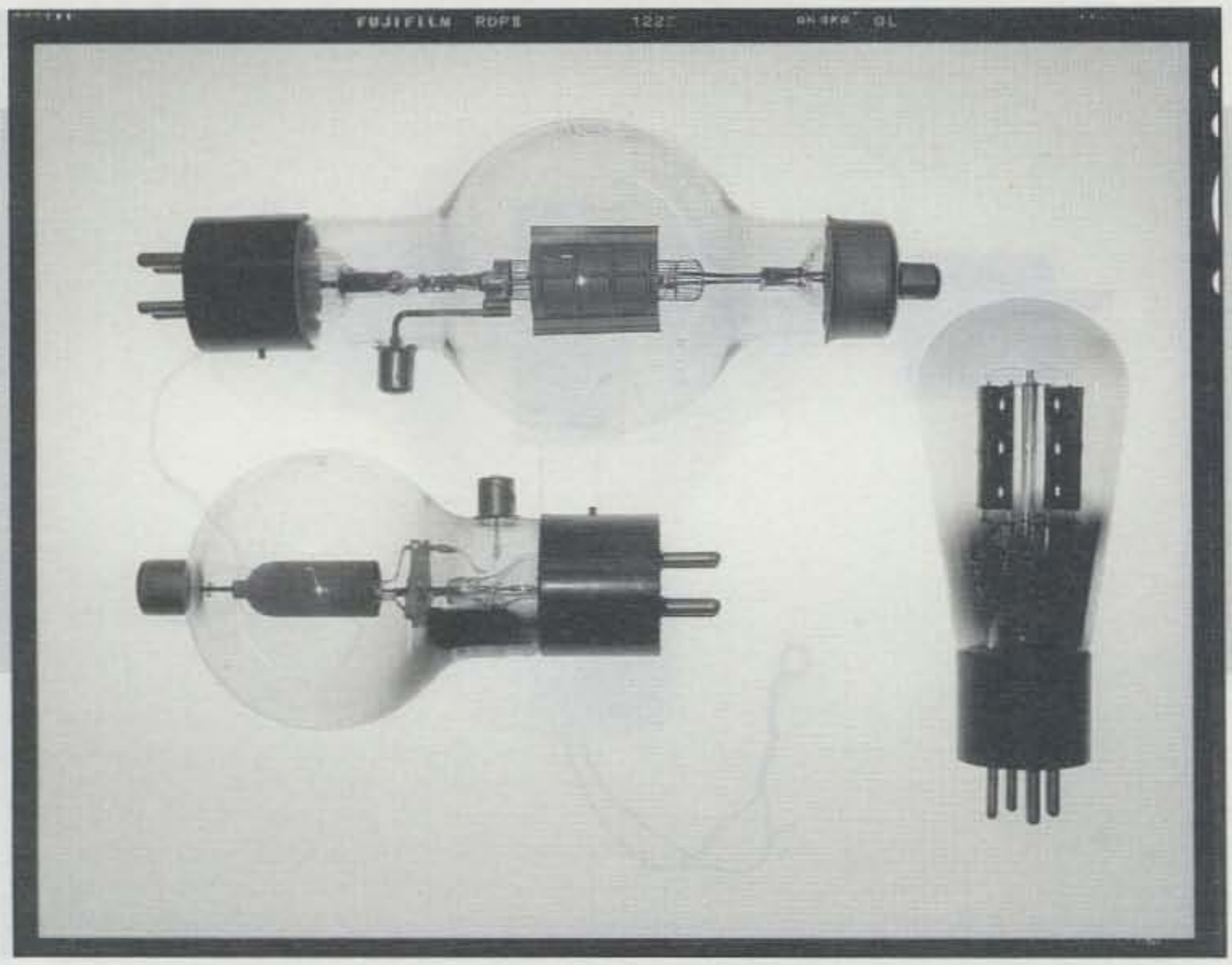

Photo 3– (Top left) The Raytheon RK-38 transmitting triode introduced in late 1936 and designed for amateur application; (bottom left) an 808 triode manufactured by Taylor Tubes of Chicago; (right) an early version of the 80 rectifier carrying the Eveready Battery Company brand name.

both form and function, this element is appropriately named. Rather than having all connections to internal elements made through pins in the tube base, many early transmitting tubes brought grid and plate connections out to contacts in the tube envelope itself. This was done to reduce inter-electrode capacitance as well as eliminate the flash-over and stem-puncture problems common with base connections.

Photo 2 is a 1927-vintage UX-852 transmitting tube. It was introduced by RCA in the spring of that year as a solution for the amateur seeking a reliable, moderate-power tube useful on the shortwave bands and even at VHF. It was rated at 75 watts output, and its low internal capacitance made it stable down to 5 meters. As you can see, the grid connection is made through the wires at the top of the tube (right side of the photo) and the plate lead comes out the side. RCA chose to use through-the-glass wires rather than caps or other connectors for this tube. It sold for $32.50. The 852 developed a reputation for withstanding abuse well beyond its published ratings, making it the ideal amateur product and economical in the long run.

The top tube in photo 3 is an RK-38, another transmitting triode released by Raytheon in late 1936 and designed for amateur application. The $14.50 tube was rated at 225 watts output. The second tube down from the top is an 808, a type introduced by RCA in 1936. The example pictured is a slightly different, later version manufactured by Taylor Tubes of Chicago. The triode was rated for 140 watts output in class C telegraphy service or 105 watts phone. A pair of 808s delivered 185 watts of class B audio. Amateur net for the tube was $10.00. At the far right is an early version of the 80 rectifier carrying the brand name of the Eveready Battery Company. The tube debuted as the UX-280 in 1927 and remained in production, somewhere in the world, for more than 50 years. Its filament voltage increased

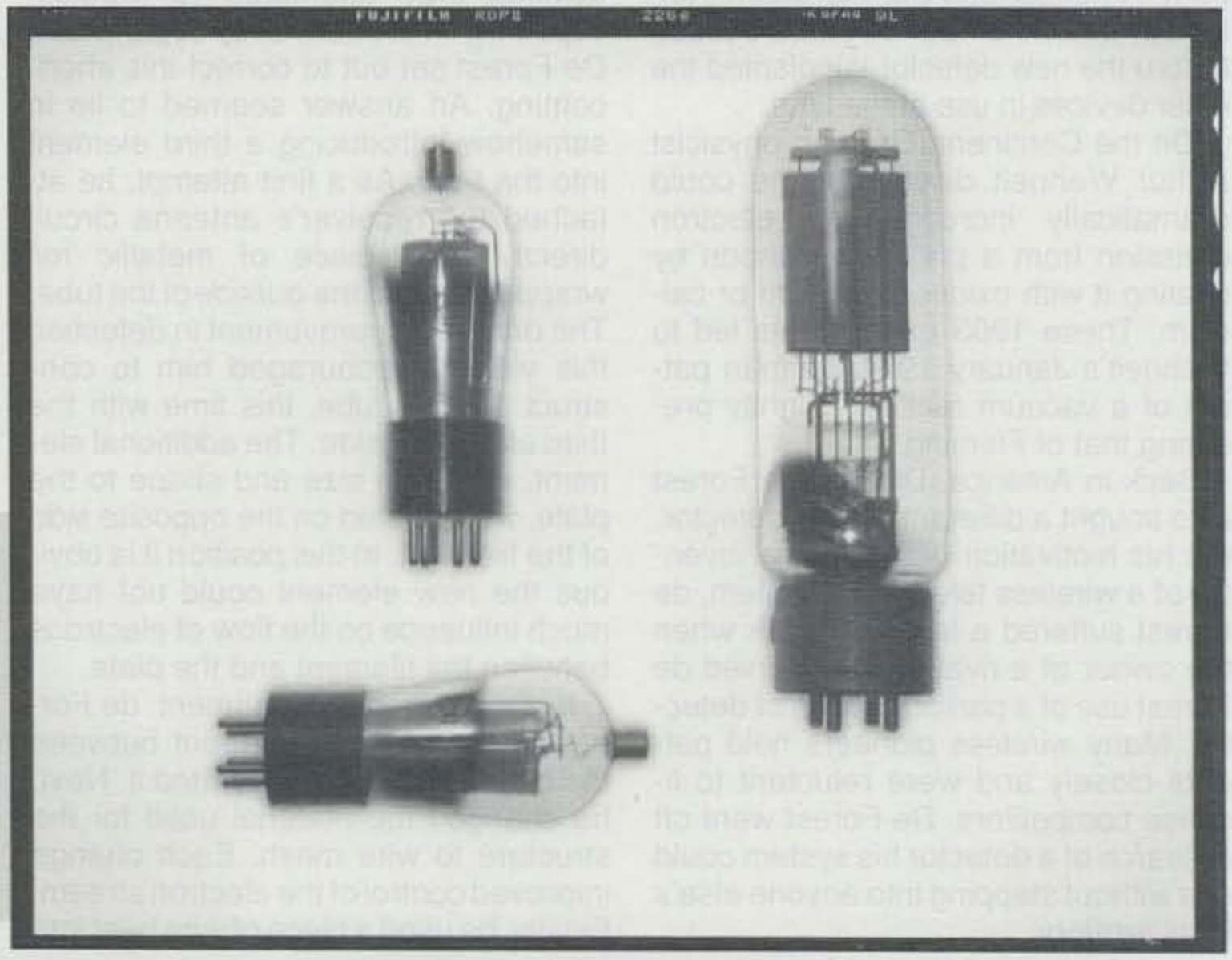

Photo 4– (Top left) The RCA Radiotron 235, a remote-cutoff tetrode commonly used as an RF or IF amplifier in AC-powered receivers; (bottom left) the UY-224, an early AC heater, screen-grid tube; (right) the Western Electric 242A transmitting tube.

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to 5 volts and the glass envelope decreased in size during this long run.

The tube at the top left in photo 4 is an RCA Radiotron 235, a remote-cutoff tetrode commonly used as an RF or IF amplifier in AC-powered receivers. It was brought to market in 1931 as a replacement for the tube pictured below it, the UY-224, addressing some of the latter's shortcomings. The 224, an early AC heater, screen-grid tube, had been on the market since 1929, but had a propensity to distort strong signals and generate mixing products in the presence of two or more moderate signals. The 235's unique construction of both screen and control grids, as well as its variable-μ operation, went a long way toward solving these problems. At the right is a transmitting tube, the Western Electric 242A, originally designed for the Coast Guard service, but also used by the telephone company, in movie theater sound systems and aircraft transmitters, and finally, by amateur radio operators. The robust triode was marketed to hams in 1936. In class C service, it was good for 125 watts out on CW or 100 on phone. A pair was rated at 200 watts of class B audio.

The 4-1000 in photo 1 serves as a reminder that the vacuum tube is still king in legal-limit amateur power amplifiers. Not all amps use big glass bottles such as this one; metal and ceramic tubes are also popular choices. Speaking of 4-1000s, not everyone considers them amplifiers. My friend over in Georgia, Andy Howard, refers to them as *drivers*. Even though maximum amateur power levels are well within the range of modern solid-state devices, I believe it will be a long time before they supplant tubes as the devices of choice in final amplifiers. Many readers of this column enjoy the friendly glow of vacuum tubes in their receivers, as well.

On a Personal Note . . .

Finally, to some personal business: November's "Radio Classics" column was excerpted from a presentation planned for the 2001 Collins Users Conference. The conference went off in fine style; unfortunately, I was involved in a serious automobile accident on October 2nd and was unable to take part. Conference organizers—including Jay Miller, KK5IM, Glenn Kitto, N5OD, and Pete Zilliox, K5PZ—moved heaven and earth in an effort to accommodate my damaged body, but wisdom and medical reality eventually prevailed and kept me home. Thanks for a magnificent try against a last-minute problem, guys.

As a consequence of my accident, I have fallen behind in responding to e-mail and voice mail. If you've tried to contact me and are still awaiting a reply, please accept this blanket apology, and I *will* get back to you individually. One of the great joys of writing this column is the feedback from readers that turns monologue into dialogue.

I've heard from several of you asking if the *2002–2003 Radio Classics* calendar is still my work. Yes, indeed, it is! Since the calendar covers 15 months, the new edition still has over a year's worth of use left. It is available at many hamfests, from ham radio vendors, or direct from *CQ* (800-853-9797).

73, Joe, N4QB

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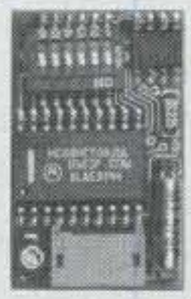

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DX

BY CARL SMITH, N4AA

News Of Communication Around The World

DX R_x: Respect, Patience, and Common Sense

As I write this, in early December, we are experiencing some unusually warm weather (daytime temperatures in the '70s). It's definitely not seasonable, but it *is* great for that last-minute antenna work before the winter sets in!

P5 – North Korea

P5/4L4FN from North Korea continued to operate on 20 and 10 meters before taking his Christmas break at home. He was due to be gone for about a month from mid-December to mid-January. Ed's activity from this #1 Most Needed country created some very serious problems on the air. These problems were the result of over-anxious DXers, or is it uneducated DXers?

Whichever the case may be, the problems could jeopardize Ed's operation or could cause the government to have second thoughts about issuing a written authorization. Bernie, W3UR, summed it up rather well in a statement issued on December 5th. Here's what he had to say:

It has now been a month since Ed, P5/4L4FN, showed up on the air. As we all know, North Korea was the most wanted DXCC Entity, until November 16th when Ducie Island was added to the DXCC list. Who would have ever thought that P5 would be #2? Remember when North Korea was added to the DXCC list? How about the demands to remove it because no one could operate from this rare location? After the first and second operations still more cries of take P5 off the DXCC list. Activating North Korea has been a work in progress, taking one step at a time.

The current P5/4L4FN operation is part of that work in progress. DXers around the globe need to have the patience, understanding, and foresight that this is only the beginning. Several issues are going on both in public and behind the scenes. Hopefully nothing that has been done will jeopardize this operation. Trying to send e-mails to the World Food Program and Ed could be very dangerous to the operation. The policemen, hecklers with all their comments being made on Ed's frequency do nothing to help the situation. In fact, it could actually damage future operations. Everyone must realize that the North Korean authorities recognize what is going on with P5/4L4FN and are monitoring everything. Our display of amateur radio to those in charge of the future in North Korea is at stake.

Many are wondering about the license to operate from the second rarest QTH on the planet. DXers are asking, "How come only an oral permission?" DXers who ask this question are absolutely thinking correctly; however, keep those comments and questions off Ed's frequency. This can be damaging.

Let's not worry about a license, as we all know there is no amateur radio service in North Korea. Ed has been in Pyongyang working for the WFP for almost three years now and he knows how the system works. I cannot tell you every detail, but I can tell you that up until recently, communications (phone calls, satellite, radio, e-mail, etc.) have been very tight in and out of North Korea.

That is, until recent openings of several western embassies in Pyongyang. Until then other organizations have not been able to use certain modes of telecommunications to their full extent. However, now the door has been opened, if only so slightly.

Authorization for these new modes of communications has been given orally, including Ed's operations. A more formalized written authorization is expected, perhaps this month.

As we all know, amateur radio is a great means of spreading international goodwill. As DXers, each of us has the responsibility of helping to spread the word as ambassadors. *—73, Bernie, W3UR*

I think Bernie expresses the feelings of most DXers. Those who are causing the problems know who they are—and most of us know who they are, too. It's time for us to take a hand in stopping this type of activity. Some of those involved are old-time DXers who certainly know better than to engage in this inappropriate behavior. If you hear this "stuff" and know who it is, don't be embarrassed or afraid to tell him/her you don't approve of it, *but do it to his/her face or on the telephone—not on the air.* Don't get involved in arguments on the air. Remember that our signals go all over the world. Let's not air our "dirty laundry" in public for the world to hear. Do it one-on-one, or at DX gatherings when and where appropriate.

YA5T – Afghanistan

Not long after my November column with the article by Peter, ON6TT, was written, events occurred which allowed him to return to Kabul. His first priority was to do his job for the UN and reestablish the communications systems for them in Afghanistan. He did find time to secure a license to operate as YA5T, though, and managed a few thousand contacts with his barefoot IC706 and a dipole. Peter was traveling during December and expected to be on the air when and where possible as his work load permitted. The other three operators on the YA5T license (S53R, SM7PKK, and ON4WW) were not expected to be in Afghanistan until after the first of the year.

When possible, Peter and the others will bring bigger and better gear and antennas and be able to operate for longer periods of time on most bands, as their work allows. All of these gentlemen work for the UN and they have

(Left to right) OM1AM, DJ9ZB, and DJ2AA shown at the operating position of HB9ITU during the Geneva exhibition. (Photo courtesy Franz, DJ9ZB)

Franz, DJ9ZB, listens intently during the CQ WW SSB Contest from 4U1ITU. Franz and DJ2AA operated the station October 27–28, 2001. (Photo courtesy DJ9ZB)

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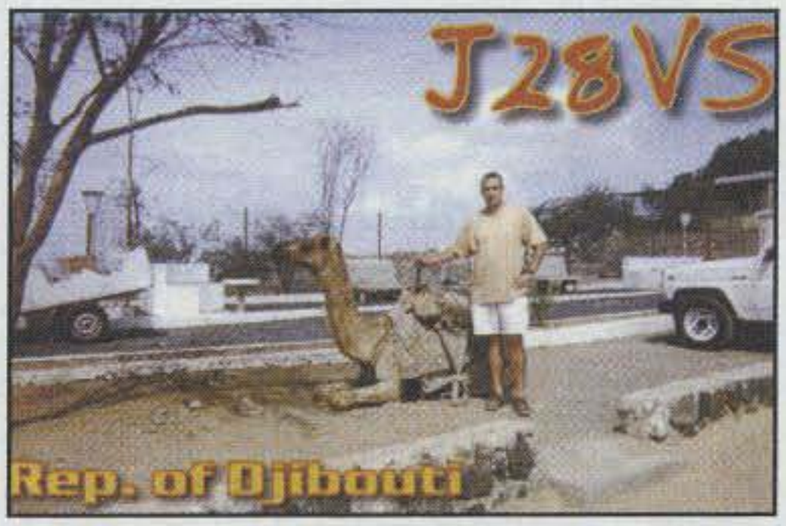
North America: AA1KS, W2FKF

Award of Excellence: W4GP

Award of Excellence Holders: K6JG, N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, I0JX, WA1JMP K0JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SM0DJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SM0AJU, N5TV, W6OUL, WB8ZRL, WA8YM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DE0DXM, DK4SY, UR2QD, AB0P, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KB0G, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YB0TK, K9QFR, 9A2NA, W4UW, NX0I, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DE0DAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, I0RIZ, I2MQP, F6HMJ, HB9DDZ, W0ULU, K9XR, JA0SU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, K0IFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, K0DEQ, KU0A, DJ1YH, OE6CLD, VR2UW, 9A9R, UA0FZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RA0FU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, W4GP.

160 Meter Endorsement: K6JG, N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SM0DJZ, DK3AD, W3ARK, LA7JO, SM0AJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DE0DXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KB0G, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YB0TK, K9QFR, W4UW, NX0I, WB4RUA, I1EEW ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WB0DD, I0RIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JA0SU, I5ZJK, I2EOW, KS4S, KA5CLV, K0IFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, K0DEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RA0FU, UA0FZ, CT4NH, W1CU, EA7TV, LY3BA, RW9SG, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, W4GP.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA. ***NOTE:*** *WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means.*



Stephane, J28VS, checks out the local form of transportation in the Republic of Djibouti. QSLs for Stephane's operation go via his QSL Manager, F4DBF. (Photo courtesy KD0JL)

in January and February of 2002. Operators are EI6FR, EI5IQ, HB9ASZ, PA3FQA, K0IR, W3WL, K4UEE, VE3EJ, N5KO, K5TR, W7EW, and 9V1YC.

Exact dates, callsigns, and QSL managers are not being made public until we are on the air. The New Zealand registered vessel *Braveheart* of ZL9CI fame will be supporting this team of 12 for the entire 30-day trip.

This DXpedition is the result of over two years of planning, coordination, and detailed

Takashi, T32CY, and Hiro, T32CY, at their operating position on Christmas Island, East Kiribati (reportedly the world's largest atoll). They made 13,000 QSOs in eight days—not bad for a vacation at the Captain Cook Hotel. (Photo courtesy John, KD0JL)

a job to do—a big job in the midst of all of the turmoil. Please don't harass them for schedules, etc. They will operate as much as they can. The Northern California DX Foundation is assisting financially with the QSL cards and Steve, KU9C, agreed to handle the QSL chores for all YA5T contacts.

VP8 – South Georgia and South Sandwich

A surprise news release in early December by James Brooks, 9V1YC, promised a major DXpedition to these two Antarctic islands early in 2002. Here's what James had to say:

VP8/sg South Georgia and VP8/ss South Sandwich will be activated on the HF bands

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CW 160, 160-10 m. 252' Be heard on 160 $135
CW 160 Special, 160-10 m, 132' Be on all bands $125
G5RV Plus, 80-10 m, 102', High power current balun $59.95

Current Baluns

B1-2K	1:1	2 KW SSB	80-10m	Current Balun	$24.95
B1-5K	1:1	5 KW SSB	160-10m	Precision	$35.95
B1-1KV	1:1	1 KW SSB	15 - 2 m	VHF balun	$29.95
Y1-5K	1:1	5 KW SSB	160-10m	"YagiBalun"	$37.95
B4-1KXV	4:1	1 KW SSB	15 - 2 m	VHF balun	$33.95
B4-2KX	4:1	2 KW SSB	160-10m	Precision	$49.95

NEW RFI QUICK FIX

For really tough RFI and RF feedback problems, you can't beat the new T-4 and T-4G Ultra Line Isolators. It's isolation factor is 50% higher than previous models - far better than expensive imported copies. The T-4G goes even further with it's built-in ground strap for direct line Isolator grounding. Before coax enters your shack, stray RFI is shunted directly to ground. Use with Vertical antennas at feed point. To prevent ground loop problems, install two T-4s between your transmitter, linear and tuner. Use with any antenna to reduce feed line radiation. This is the RFI BIG GUN.

All Line Isolators have SO-239 input and output connectors. 160-10 m, 2 KW+, winding Z @ 3.5 MHz > 75K, @ 14 MHz > 50 K

T-4	Same as T-4G but without direct grounding	$34.95
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T-5G	Marine version, HF & VHF isolation -the best	$49.95
T-6	VHF version of T-4 15 - 2 meters, 1 KW	$31.95

Jim's New Book - "Frequently Asked Questions about Antenna Systems and Baluns." This 120 page book answers questions and dispels myths. The material is presented in a style that's easy to read and Jim, W4THU, is not beyond poking fun at jealously held concepts that don't quite hold up under close scrutiny. However, at the heart of this book are questions that a lot of hams ask over and over again. Available now - $12.95 + $3 postage.

Antenna Wire and Parts
"And, not a dog in the bunch!"

PL-259ST	Silver-Teflon, U.S.A.	SALE	$1.00
PL-259GT	Gold-Teflon, U.S.A.	$1.49 or $30 pk of 25	
N-200	'N' Silver-Teflon, installs like a PL-259		$3.00
		Coax & cable prices	<100'/100'+
RG-8X Plus	Type IIA non-contaminating jacket, 95%		26¢/22¢
RG-213 Plus	Enhanced, 96%+super quality jacket		54¢/38¢
SALE 100' or more	RG-8X Premium, 95% braid		14¢
	RG-213 Top Quality, 95%		35¢
	ExtraFlex Flexible 9913-type		59¢
R1 Rotator	8 conductor (2 x #18, 6 x #24	SALE	26¢/20¢
R2 Rotator	8 conductor (2 x #16, 6 x #18)	SALE	47¢/35¢
#14 HD	Stranded, 7-conductor hard-drawn		8¢
#14 FlexWeave	168-strand, bare, for any wire ant.		14¢
#12 FlexWeave	259-strand, excellent for long runs		19¢
#13 Insulated	Very tough jacket, strong, for heavy weather		16¢
450 Ladder	#16 stranded conductor, poly.	SALE	22¢/17¢
450 Ladder	#14 stranded conductors, poly	SALE	30¢/26¢
1/2" Braid	Tinned-copper, for grounding, any length		65¢
2" Strap	Copper strap, heavy .020" thick any length		$1.75

Pulleys - for antenna support rope. Highest quality, small, lightweight, sailboat type - #224 for 3/16" rope $11.95 or #082 for 5/16" rope $13.95

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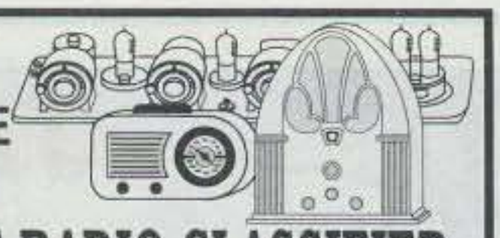

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The WAZ Program

15 Meter CW

294 .....NIØC

20 Meter SSB

1085 .....HI3/W4DT

20 Meter CW

520 .....IK2ECP 521 .....T94GB

30 Meter CW

45 .....HB9DDZ

All Band WAZ

SSB

4711 .....HB9DDO
4712 .....KR4JY
4713 .....IZ1CCF
4714 .....IV3TDM
4715 .....I6IBS
4716 .....IZØCKJ
4717 .....KA3FZN
4718 .....F8KOH
4719 .....JP1HDK

Mixed

8083 .....IKØGDG
8084 .....W8OI
8085 .....AA9IV
8086 .....W3GQ
8087 .....OK2BBD
8088 .....HL5NJE
8089 .....HJ3JSF
8090 .....UAØYAY
8091 .....JP1SRG
8092 .....IT9EJW

All CW

279 .....HB9DDO
280 .....K3GW
281 .....HB9AGO

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Paul Blumhardt. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached via e-mail: <k5rt@cq-amateur-radio.com>.

5 Band WAZ

As of November 15, 2001, 574 stations have attained the 200 zone level and 1227 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:
None

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
ABØP, 199 (23)
KL7Y, 199 (34)
NN7X, 199 (34)
IK1AOD, 199 (1)
DF3CB, 199 (1)
F6CPO, 199 (1)
KC7V, 199 (34)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W6SR, 199 (37)
W3NO, 199 (26)
K4UTE, 199 (18)
HB9DDZ, 199 (31)
RU3FM, 199 (1)
HB9BGV, 199 (31)
N3UN, 199 (18)
OH2VZ, 199 (31)
K2UU, 199 (26)
W1FZ, 199 (26)
UT4UZ, 199 (6)
SM7BIP, 199 (31)
K4ZW, 199 (23)
W9RPM, 199 (19)
PY5EG, 199 (23)
SP5DVP, 199 (31 on 40)
EA5BCX, 198 (27,39)
G3KDB, 198 (1,12)
KG9N, 198 (18,22)
KØSR, 198 (22,23)
UA4PO, 198 (1,2)
JA1DM, 198 (2,40)
9A5I, 198 (1,16)
LA7FD, 198 (3,4)
K5PC, 198 (18,23)
VE3XO, 198 (23,23 on 40)
K4CN, 198 (23,26)
KF2O, 198 (24,26)
W6BCQ, 198 (37,34on40)
G3KMQ, 198 (1, 27)
W5BOS, 198 (18,23)
N2QT, 198 (23,24)
OK1DWC, 198 (6,31)
K7FL, 198 (23,37)
W4UM, 198 (18,23)
UU2JQ, 198 (30on40&20)

The following have qualified for the basic 5 Band WAZ Award:
WØIJN (184 zones)

Endorsements:
EW2AA (200 zones)
OE2BZL (197 zones)
KØDEQ (193 zones)
NIØC (171 zones)

****Please note: Cost of the 5 Band WAZ Plaque is $80 ($100 if airmail shipping is requested).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Paul Blumhardt. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached via e-mail: <k5rt@cq-amateur-radio.com>.

permit applications by 9V1YC, EI6FR, and N5KO.

A few important points:

1. This DXpedition is funded entirely by the 12 team members and a grant by the Northern California DX Foundation. There are no club, individual, equipment, or QSL sponsors.

2. There will be no websites, no online-logs, no pilots, and no promises of any bands or modes. Given the dangerous nature of our destination we will simply focus on giving out a new overall DXCC entity.

3. Due to heavy environmental and safety restrictions on our permit we are taking ultra-light generators, simple antennas, and low power. Despite a lengthy and difficult application process we are extremely grateful to the government of South Georgia and the South Sandwich Islands for their support and cooperation in this endeavor. Please understand that personal safety and a clean environmental approach are as important to us as they are to them.

4. Even though we are with an experienced Antarctic-rated support vessel and crew, there is always the chance we may not even make it to one of our destinations (Thule Island, South Sandwich) due to the extreme nature of the Southern Ocean. We are prepared for this, and we hope the DX community will be, too.

5. This DXpedition is *not* about QSO totals. In fact, it is quite the opposite. Unlike previous DXpeditions you may have worked, this time we are taking far less hardware and presenting the DX community with much more of a challenge. We feel that DXers need to get back to basics and work harder, so this time the burden of working the DXpedition is being shifted back home. (The hunt will be part of the fun, so if you need either of these two countries as an all time new one we suggest you beef up your stations and train your ears.)

6. We may be restricted to 6 dB less of signal, but we are taking 30 dB more of operator. You will probably notice many familiar callsigns on the roster.

See you on the bands.

—James Brooks, 9V1YC

Visit Our Web Site

THE WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix list. Scores are based on the current prefix total, regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, files will be made inactive.

MIXED

5054 .....9A2AA
4412 .....W2FXA
4095.....F2YT
4086.....K6JG
4034 .....W1CU
3960 .....EA2IA
3846.....N4NO
3809.....N6JV
3772 .....UA3FT
3734.....VE3XN
3624 .....9A2NA
3606 .....N4MM
3573.....N9AF
3523...SM3EVR
3513 .....I2PJA
3465.....N5JR
3458.....YU1AB
3144...PAØSNG
3121 .....KF2O
3118 .....W9HA
3091 ..WA8YTM
3090 .....S53EO
3084.....I2MQP
3060 ..WB2YQH
3029 ...YU7BCD
3027 .....YU7SF
3026 .....K9BG
3019.....IT9QDS
2945 .....I2EOW
2873.....IK2ILH
2853 .....KØDEQ
2849.....4N7ZZ
2835 .....W2WC
2800....JH8BOE
2773.....W2ME
2743 .....HAØIT
2597.....HA5NK
2469 ..YU7GMN
2464.....K2XF
2455 .....N6JM
2424 .....W9IL
2380.....9A4W
2372.....S58MU
2314 .....W6OUL
2305 ....W8UMR
2291 .....K5UR
2170 .....W4UW
2093.....W7OM
2028 ..WB3DNA
2019.....HA9PP
2012....JN3SAC
1989....CT1EEB
1983 .....W9OP
1939 ...PY2DBU
1926 .....I2EAY
1916 .....DJ1YH
1871 ...OZ1ACB
1755 .....VE6BF
1745 .....AA1KS
1716.....Z35M
1670 .....W7CB
1651 ...I1-21171
1613.....YU1ZD
1496.....KØKG
1436.....N1KC
1429.....W2EZ
1418.....WT3W
1408 .....NG9L
1343 .....VE6FR
1295 .....VE9FX
1263...VE6BMX
1236...EA2BNU
1199.....KU6J
1165 .....KX1A
1147.....W2CF
1082..OK1DWC
1040...PY1NEW
1006.....K6UXO
937 .....N3KR
687 .....VE3NQK

SSB

4306.....IØZV
4128.....VE1YX
3927 .....ZL3NS
3784 .....K6JG
3547.....F6DZU
3503.....I2PJA
3172 .....CT4NH
3168.....N4MM
3097.....OZ5EV
3056 .....EA2IA
2995 .....F2VX
2980 .....N4NO
2968...EA8AKN
2902 .....I2MQP
2900 .....N5JR
2888 .....I4CSP
2877 .....9A2NA
2758...PAØSNG
2706 .....I2EOW
2672...CT1ANU
2621 .....4X6DK
2619 .....KF2O
2515...LU8ESU
2515 .....EA5AT
2488 .....I8KCI
2412..WA8YTM
2404.....KF7RU
2381...YU7BCD
2333 .....W2WC
2332 .....CX6BZ
2325 .....EA1JG
2202 .....IN3QCI
2038...OE2EGL
2033.....HAØIT
1989 ...CT1EEB
1981 ...CT1EEN
1972 .....W4UW
1950.....K5UR
1945.....LU5DV
1860 .....N6FX
1860 .....K2XF
1748.....YU7SF
1717 .....W9IL
1712.....NQ3A
1707 .....I8LEL
1698 .....EA7TV
1690 .....K3IXD
1667 .....KS4S
1655 .....K5IID
1643.....W6OUL
1631 .....HA5NK
1626 .....W70M
1617 .....I3ZSX
1599 ....DK5WQ
1591 .....IT9SVJ
1585.....K8MDU
1568 .CT1BWW
1562.....W2ME
1545...SV3AQR
1532.....DF7HX
1524 .....IKØEIM
1493 ....IK2AEQ
1427 .....N3XX
1421 .....W2FKF
1410.....T30JH
1385 .....I3UBL
1318 .....N2SS
1311 .....KC6X
1287.....KI7AO
1273 .....NG9L
1239.....LU4DA
1222...LU3HBO
1192.....K4CN
1165 ...EA5DCL
1154 .....WT3W
1141.....IKØJMS
1138.....VE9FX
1130 .....I2EAY
1111.....EA3KB
1092.....N1KC
1070....JN3SAC
1064.....NH6T
1051 ...EA3EQT
1005....DL8AAV
990.....HA9PP
982.....AG4W
972.....AI6Z
812.....KU6J
783.....VE6BMX
781.....N3DRO
717.....F5RRS
716 .....KX1A
680....OK1DWC
652.....F5LIW
634 .....F5UTE
609.....VE7SMP
605 .....KE4SCY

CW

4129 ..WA2HZR
3781.....N6JV
3399 .....N4NO
3365...VE7CNE
3353 .....K6JG
3043 .....K9QVB
3021 .....YU7LS
3005 .....EA2IA
2699.....LZ1XL
2589 .....N5JR
2566.....9A2NA
2548.....N4MM
2534 .....W2NE
2437...YU7BCK
2396..WA8YTM
2238.....W2WC
2238...JA9CWJ
2232 .....KF2O
2198....EA7AZA
2184 .....KA7T
2105.....G3VQO
2016 .....N6FX
2000 .....OZ5UR
1996 .....G4SSH
1946 .....I7PXV
1946 .....W2YA
1923 .....K2XF
1855.....K5UR
1779 ....IT9VDQ
1762.....W6OUL
1744 ....IK3GER
1706....JN3SAC
1658.....VE6BF
1620 .....I2EAY
1590 ..EA7AAW
1572 .....W9IL
1546 .....W7OM
1485.....9A3SM
1480 .....IK5TSS
1466.....IK2ECP
1452.....EA6AA
1390 .....I2MQP
1361 .....4X6DK
1340 ....EA2CIN
1339.....LU3DSI
1310.....I2EOW
1248.....AC5K
1154 ...LU7EAR
1150.....DF6SW
1121 ...EA2BNU
1101.....YU1TR
1060.....W4UW
1034.....WO3Z
987 .....K6UXO
935.....VE6BMX
926.....PY4WS
898.....JK1AJX
887 ....WA2VQV
832 .....WT3W
814.....KU6J
750 .....KX1A
732.....N1KC
612.....F5RRS
604 .....EA5DCL

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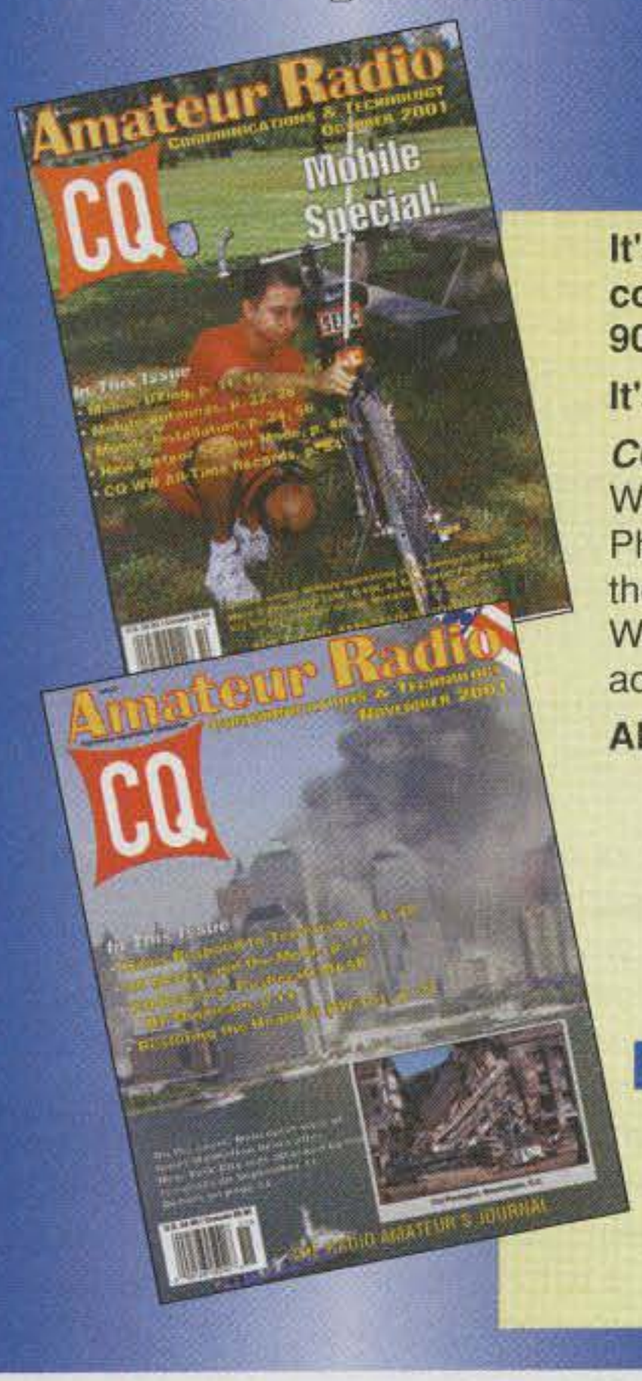

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SSB Endorsements

320 .....VE2GHZ/331
320 .....N5ORT/329
320 .....IØSGF/327
300 .....4X6DK/300
200 .....IK1PFE/241
200 .....EA1ET/204
28 MHz.....IK1PFE
28 MHz.....EA1ET

CW Endorsements

320 .....WB4UBD/329
320 .....NØFW/327
275 .....UA9SG/279

RTTY Endorsements

320 .....WB4UBD/327
320 .....NI4H/324
300 .....PA5PQ/301
275.....W4EEU/297

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Map showing the location of Cocos Island off the west coast of Costa Rica.

A number of the top ten Most Wanted countries have been on the air in the past year. Certainly DXpeditioners are going to have to look more closely at the rankings of Most Wanted for the next year or so as they try to find a place to which to travel for the Deserving. I personally would like to see our friends in France activate the islands of Gloriso, Juan de Nova, Crozet, Kerguelen, and Amsterdam. Especially nice would be a major operation from Juan de Nova. How about it?

TI9 – Cocos Island DXpedition

Showing up in the mid-20s on *The DX Magazine*'s 2000 Most Wanted Survey, for most of the world, Cocos Island will be the target of a DXpedition beginning February 17, 2002 and will run for 12 days. The group of 15 operators from the U.S., France, Germany, Italy, Russia, and probably Romania will participate in this operation. The group was looking for additional financial support for their effort with donations payable to Grupo Isla Del Coco, being accepted at: Grupo Isla Del Coco, Apartado 220-6100, Ciudad Colon, Costa Rica. Check their website: <www.qsl.net/ti2hmg/ cocos.htm>. (See the map showing the location of Cocos Island in this column.)

Six meters saw unbelievable activity in early December as the band provided worldwide DX with outstanding signals for long periods of time. Many DXers were spending their time chasing countries on the Magic Band while propagation exceeded anything in recent memory.

Until next month, have fun, but please do it with common sense and respect for your fellow DXers. 73, Carl, N4AA

QSL Information

2E0APH via G3WRO
3C0N via DJ6SI
3DA0FR via DL7DF
3G5A via XQ5SM
3V8BB via YT1AD - 2001 CQWW SSB*
3W2DC via N4CD - 2001 Oct. 2–15
3W2ER via G4ZFE - 2001 CQWW CW**
3W2KHO via WB2KHO - 2001 Nov.
3W2SF via WB2KHO - 2001 Nov. 5–16
4D69SAN via DU1SAN - 2001 Oct.-direct only
4J6ZZ via UT3UY
4K5CW via UT3UY
4X0J via 4X4FJ - 2001 CQWW SSB
5B4AGU via LZ1MS
5H1X via KQ1F - 2001 CQWW CW
5H2MN via DF8AN - 2001 Nov.
5N6NDP via IK5JAN - 2001 Nov.
5V7BR via F5RUQ - 2001 Nov.
5W0MO via OM2SA - 2001 Oct. 16–22
5X1Z via SM6CAS - 2001 CQWW CW
5Z4KE via DF8AN - 2001 Nov.
6L0UR via HL5AP - 2001 Oct.
6Y0A via WA4WTG - 2001 CQWW CW
6Y1A via WA4WTG - 2001 CQWW CW
6Y2A via WA4WTG - 2001 CQWW CW
6Y4A via WA4WTG - 2001 CQWW CW
6Y8A via WA4WTG - 2001 CQWW CW
6Y9A via WA4WTG - 2001 CQWW CW
7J1AOE via K3DI - 1993 to current
7Q7RV via ZS6DX - bureau okay
7Q7TV via ZS6DX - 2001 Oct., bureau okay
7Q7TV via ZS6DX - 2001
7S2E via SM2DMU - 2001 CQWW CW
7S5A via SM5CEU
8P2A via K9PG - 2001 CQWW CW
8P4B via KU9C - 2001 CQWW SSB
8P9HAT via K4BAI - 2001 Nov.
8P9JA via K4MA - 2002 ARRL DX CW (Feb. 16–17)
8P9JG via W2SC - 2001 CQWW SSB
8P9Z via K4BAI - 2001 CQWW CW
8Q7KT via HB9KT - 2001 ending Nov. 11
8S6M via SM6NM
9A1P via 9A2RD - 2001 CQWW SSB
9G5KW via W7XU - 2001 Oct. 30
9G5XU via W7XU - 2001 Oct. 26 - Nov. 5, direct only
9H0WW via G0OFN - 2001 CQWW SSB
9K9X via 9K2RR - 2001 CQWW CW
9L1BTB via SP7CDG - 2001 start Oct.
9M6A via N2OO - 2001 CQWW SSB & CW
9M6APT via SP9PRO - 2001 Nov.
9M6EVT via SP9BRP - 2001 Nov.
9M6LSC via JA2ADH - 2001 Nov. 8–11
9M6NA via JE1JKL - 2001 CQWW CW
9M6SEA via N2OO - 2001 Nov.
9M6TBT via KD3TB - 2001 Oct. 26-29
9M6TDC via JA1BRK - 2001 Nov. 8–11
9M6US via N2OO - 2001 Oct. 26 - Nov. 6
9M8AER via JA3AER - 2001 Nov.
9M8ART via JA3ART - 2001 Nov.
9M8HCK via JA4HCK - 2001 Nov.
9M8JAA via JA3AA - 2001 Nov.
9M8JUB via JA3UB - 2001 Nov.
9M8MVF via JR3MVF - 2001 Nov.
9N7MH via DL7VMH - 2001 Oct. 28 – Nov. 5
9Q5MRC via G3MRC, Joe, 18 Grosvenor Avenue, Kildderminster, Worcs., DY10 1SS, England
A35OY via KF8OY - 2001 Nov.
A92DX - pirate (Oct. 2001 is a pirate per A92GE)
AH2R via JH7QXJ - 2001 CQWW SSB & CW
AP2AUM via KK5DO - 2001
C4W via 5B4WN - 2001 CQWW CW
C6AKP via N4RP - 2001 CQWW CW
C6AKQ via N4BP - 2001 CQWW CW
C91MR via G3MRC - Joe, 18 Grosvenor Avenue, Kidderminster, Worcs., DY10 1SS, England
C96MR via G3MRC - 2001 Nov.
CE0Z/KM9D via OM2SA - starting 1995
CN2JS via F6BEE - 2001 CQWW CW
CO2TK via F6FNU - 2001 CQWW SSB
CQ2T via CS6ARC - 2001 CQWW SSB
CQ7O via CT1BWW - 2001 CQWW SSB
CQ9K via DL1SBF - 2000 CQWW CW
CT8T via OH1NOA - 2001 CQWW CW
CT9M via DL1SBF - 2001 CQWW CW via bureau
CT9M via CT1BOH
CU2A via OH2BH - 2001 Nov.
CX9AU via KA5TUF - 2001 CQWW CW
D44CF via SM0JHF - 2001 CQWW CW
D44TC via IV3TAN - 2001 CQWW CW
DA1LDN via ON4JM - 2001 CQWW SSB
DS01BN via HL0EMG - 2001 Oct.
DT2001PAF via DS2AXU - 2001 ending Nov. 4
DU1/SQ9BOP via SP6GVU - 2001 Oct.
E20HHK via E21EIC - 2001 CQWW SSB
E20HHK via E21EIC - 2001 CQWW CW
E30TA via HB9AAQ via 2000 CQWW SSB
ED7MDD via EA7ESH - 2001 Nov.
ER373R via ER3DX - 2001 Nov. 21 only
ES9C via ES5RY - 2001 CQWW SSB & CW
EY7AF via RW6HS - 2001 CQWW SSB
EZ10A via EZ3A - 2001 Oct.
FG/T93M via DJ2MX - 2001 Oct. 23–30
FG/T97M via K2PF - 2001 Oct. 22–30
FG5BG via T93M - 2001 Oct. 22–30
FM5BH via W3HNK - 2001 CQWW CW
FO/HG9B via HA8IB - 2001 Oct.
FO0FRY via K8PYD - 2001 Dec. 3–14 (Austral Islands)
FO0SEV via WB8YJF - 2001 Dec. 3–14 (Austral Islands)
FO8DX via W6UFT - 2001 CQWW CW
FO8DX via W6UFT - 2002 ARRL DX CW Feb. 16-17
GD6IA via K1EU - 2001 Oct. 27- 28
GM0B via GM0EGI - 2001 CQWW SSB
GM5BDM via SM4EMO - Kenneth Johansson, Yxhultsv. 123, SE-69272 Kumla, Sweden
GM7V via ZS5BBO - 2001 CQWW CW
GW7X via GW3XEJ - 2001 CQWW SSB

**CQWW SSB, Oct. 27–28, 2001*
***CQWW CW, Nov. 24–25, 2001*

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," P.O. Box 3071, Paris, TN 38242; phone 901-641-0109; e-mail: <golist@wk.net>.)

VHF Plus

BY JOE LYNCH, N6CL

All About The World Above HF

Leonids Meteor Shower Reports

The timeframe of mid-November to mid-December proved to be very productive for the weak-signal operators who hung out on 6 and 2 meters and 125 cm. With the exceptionally good *Leonids* meteor storm, worldwide reports were generated. Bracketing and in the aftermath of the *Leonids* storm operators on 6 meters enjoyed exceptionally good *F2* propagation. Because reports are aplenty and space is not, this month's column is devoted entirely to the *Leonids*. Of particular interest is the report from Mike King, KMØT, that of working the lower 48 states on 2 meters in less than six months.

As I indicated in the lead of last month's column, the *Leonids* proved to be almost a worldwide phenomenon, with unexpectedly good European propagation, better than average North American propagation, and surprisingly good Australian propagation. For some, the light show was so spectacular that they watched it rather than operating. Below are reports in no particular order.

Tomas Hood, NW7US: "Nice fireballs and streaks—quite a number going overhead. The 50.125 activity is up and down, sometimes for minutes at a time. I have worked from my location (CN87) into CM98 and DM08, which figures, as most of the meteors are somewhat to the south of us. I never dreamed I would work meteor scatter, and I did it with my 20 meter Hustler resonator on a mast kit up some 30 feet. Amazing!"

Tom McFadden, K7TRM: "Don't know about anyone else, but the question here was do I play radio or sit and watch the show. Might have to rove next time. I worked 16 grids with 46 QSOs."

Tim Marek, K7XC: "After a fun-filled day of 6 meter activity Saturday, I followed it up with very little sleep, putting the 2M9SSB Yagi back on the rover. Hooking up the 170 watt 2 meter brick to the 706mkIIg that lives in the truck, I discovered that it worked! At 0830 UTC I headed back out, but this time to a different quiet spot, along a large salt flat, to work the *Leonids*.

"By 0900 UTC I was on looking for Q's. The sky was filled with plenty of meteors, which seemed to emanate from a single place and then head to all points of the compass. Several rocks falling together, sometimes as many as eight at once, were seen. Many large rocks exploded near the end of their descent, leaving a visible gas cloud for over a minute. I watched as one to the NW exploded visually immediately, followed by 2 meters going nuts for over a minute in the same direction with plenty of stations heard back scatter as well.

"Being out in the cold, standing next to the truck with the microphone pulled through an open window, CQing while watching the show was quite different from what I'm used to. Back in the truck with all the lights off, idling in the middle of a large salt flat, I learned just now dynamic and fluid meteor showers really are. I would point the truck/antennas at each burn I saw and was rewarded with usable burn after usable burn. Maybe being in my mobile is not a disadvantage after all! I saw one large 'blue whizzer' come lumbering in, glowing molten red with a huge greenish blue tail.

"At 0955 UTC I worked KB5XC in DM65; then Ned AA7A in AZ; at 0958 my friend Larry, K7MI, in CN73 went into the log. At 1003 WA6HXD in DM12 was worked backscatter; at 1005 I work W7USB in DN17 on the direct heading. Heard a 'W6PF' (?) in DM23 via backscatter but no joy. By now the band was full of signals sounding reminiscent of 6 meters the previous morning. W1IPL in DN62 went in the log at 1022 with K5JL in EM15 at one minute later.

"Then it started to slow down. Not as many rocks falling, but some real big ones with huge burns. At 1046 NØVSB in DM79 was worked, along with a partial with WBØJNR. Then I worked K7HK in DN30 via backscatter. At 1111 I found VE5UF loud and CQed from DO61. A minute later he was in the log. Things really were slowing up then. Big rocks started to diminish as well. At 1115 K7TNT from DN74 came screaming out the speaker and into the log.

"I continued to look for new stations but things were really slowing down with a rock maybe every minute or two. At 1200 I called it a night and headed for home. At 1306 it was time to crawl into bed and sleep till noon, if Merlin the cat would let me, that is!"

Jack Parker, W7PW: "Just spent two 20 minute sessions, from 0700–0800 UTC, outside (cold) and estimated an hourly visual rate, for that period, of no less than 4000! Some very bright fireballs, with one that had a trail that persisted for 30+ seconds! It was common to see three and four simultaneous meteors. I've watched a lot of showers (although I missed 1966) and this was the best ever! I suspect that the folks running MS were very busy!"

Ray Soifer, W2RS: "As observed here in FN20, I'd rate this year's *Leonids* maybe an eight out of ten—a good shower, but by no means a storm. According to several websites, next year's *Leonids* is supposed to be considerably better, at least over North America, with predicted rates ranging from 4700 to 10k per hour. NASA Marshall estimated this year's rate at about 2000. I wonder what it was like elsewhere in the world."

Sam Whitley, K5SW: "Wow! Started out at 0700 UTC on 144 MHz. Made about 40 QSOs via the *Leonids*. I went to bed at 0922 and got back up at 1250. This time on 222 MHz I made three QSOs via the *Leonids* to show it was working. Then I went back to 144 MHz and made 16 more QSOs until 1430.

"Then I went to 50 MHz to check out more *Leonids*, only to end up with my best ever *F2* European opening. I worked I, YU, HB9, S5, 9A, EH2, and DL.

"Finally I went back to 144 MHz at 1635 and the *Leonids* were still running hot, with K1BKK, FN34, VT, booming in, among others. Wow!"

Shelby Ennis, W8WN: "The 2001 *Leonids* produced a very good shower, with the rate approaching predictions (near or even above storm level) during some brief spikes in some locations. However, the general peak apparently was much broader than expected, for 144 MHz was alive with signals for many hours. First reports from Europe indicate a good (broad) peak several hours before the North American peak time, with some saying that this shower was the second best ever. Reports of 100 or more contacts have been received, even though Europe was not expected to get much of a shower. Question: Did the ionization from the *Leonids* contribute to the big *F2* opening on 50 MHz?"

Jake Tennant, K8JWT: "I would like to send of a great big thank you to all of the stations that were patient enough to work me on my meager mobile station, an Alinco DX70T into a PAR omni-angle loop. The stations I worked included K1KI, N1RZ, KT1J, K2HZN, W8BRL, N1RWY, AA6TT, W3TC, WB3IAL, K1DAT, W3HHN, and AA2UK. It took a whole lot of screaming, but after my first MS event I am hooked!"

VHF Plus Calendar

Feb. 3	Highest Moon declination. Good EME conditions.
Feb. 4	Last quarter Moon.
Feb. 10	Poor EME conditions.
Feb. 12	New Moon.
Feb. 15	Moon apogee.
Feb. 16	Lowest Moon declination.
Feb. 17	Very poor EME conditions.
Feb. 20	First quarter Moon.
Feb. 24	Poor EME conditions.
Feb. 27	Full Moon.
Feb. 28	Moon perigee.

• *EME conditions courtesy W5LUU*

P.O. Box 73, Oklahoma City, OK 73101
(phone 918-627-6625; fax 918-835-9785)
e-mail: <n6cl@cq-amateur-radio.com>

Doug McArthur, VK3UM: "We in VK rarely see anything like the effects of a meteor shower as is seen in the Northern Hemisphere. Generally, at best, we are lucky to realize 25 percent of what is experienced in the Northern Hemisphere. Many, if not most, showers have little effect down under!

"For the 2001 *Leonids* it was much different! It was predicted to peak between 1700–1800 UTC (0400–0500 local). The experts seemingly got it right. Visually speaking, we were blessed with a clear, crisp sky, and from this QTH with its 360° views, the display was brilliant. It was not the 1000s per hour that you read about, but at its peak we were seeing approximately two extremely bright trails in a five second period. Some of the trails were clearly visible for several minutes.

"Radio-wise, some bursts went for up to six minutes. VK participation was very good given our population. From this QTH I worked 31 stations in VK1, VK2, VK3, VK4, VK5, and VK7, all on 144 MHz SSB. These included the following: VK2DVZ, VK1VP, VK4TZL, VK4AFL, VK2TQP, VK2EI, VK4LC, VK4OE, VK2FLR, VK4BLK, VK2KU, VK4FNQ, VK2EM, VK4KZR, VK5NY, VK5KK, VK5RO, VK5ZDK, VK7MO, VK2TP, VK4AQL, VK2MP, VK4AML, VK4QV, VK2BIG, VK2ZCV, VK2ZWM, VK2DXP, VK2BRG, VK2DXE, and VK2GFY. No VK6s were heard in the eastern states nor was a VK8 active. Aurora was evident for a half hour or so just before our local dawn."

Jeff Klein, K1TEO: "Between the meteor action to start and the *F2* on 6, I worked nearly 300 QSOs today in about 6.5 hours of operating. Been a ham for 29 years, I'm sure that's the most I've ever worked outside a contest in one day!

"Got up at about 0935 UTC and looked out the window. After a few minutes of enjoying the visual show, turned on the rig and immediately heard lots of DX on 2 meters. That five minutes to warm up the amp sure seemed like an eternity!

"Over the next few hours I worked about 60 scatter contacts from FL, AL, MS, and LA to the south, around to OK, MO, and IA to the west. All QSOs were random, and all QSOs but two made on 222 were on 144 MHz. In retrospect, I wish I had tried a few skeds, especially on 222, since there was such a high likelihood of completion.

"I worked three new grids on 2 meters to add to the fun. I also worked an additional 40 or so local QSOs while working the meteors. While it was a bit of a pain since some of the local stuff called in at the same time as scatter stations, the fascinating part was how many guys called in I've never heard before. I'll look at the glass as half full, since we can use all the activity we can get on 2 and above!

"While I didn't work any scatter on 6, I did listen a lot and found scatter there to be so good that it had the consistency of sporadic-*E*. Most of the stations I heard were in there solid for very long periods of time."

Jim Shaffer, WB9UWA: "I got up at 0800 UTC and worked DX for 4 hours. The QSO rate was falling off by 1200, so I went to bed. Surprisingly, the band was still good when I got up at 1600. In all, I worked 49 stations all in normal meteor range. I used my low sidelobe 15-element at 100 feet with a 5 degree uptilt, 4×UWA12 elements at 27 feet with 15 degrees elevation (18.5 dBd) and a 4-element with a 45 degree uptilt. There was little time for rotor turning, so I used a coax switch and worked the burn on the strongest antenna. The 4-element Yagi was good on some of the closer states and was used about 10 percent of the time for contacts. The high Yagi was used about 50 percent of the time. The EME array gave me a nice pipeline into Texas much of the time. I had a pretty good time and split my time battling 144.200 MHz and working other frequencies. Several times two contacts in a row were made on a single CQ."

Szigy Iullus, YO2IS: "Here in Europe we had a fantastic show! Again the savant prediction "no *Leonids* for Europe" was wrong. When YO4RXX asked me on HF about the *Leonids* 2001, I told him, 'Switch on your radios and keep watching.'

"The '99 'show' was nothing compared to this one. As usual I was unable to wake up in time, but at 07.00 UTC I was finally at my radios. It sounded like 20 meters when West Coast stations with auroral tones are coming into Europe. I was beaming as normal to my only free 'take-off' AZ, 330 degrees. Decided to stay on 50 MHz despite the strong reflections on 144.2 MHz. Signals were in the range S1 to S9. Several times the big guns produced up to 20 dB over 9 and signals like via sporadic-*E*. While not moving the antenna, I got contacts everywhere in EU, from UT to GW and IT9 to OH, with the closest being YO5BRZ, YO7VS, and by surprise Z32ZM—hard to find from KN05ps. Europe was also busy on SSB with XV3AA via *F2* and others from Far East. My last QSO was at 12.10 with IN3JJI."

Marius Cousin, F8DO: "We really had a fantastic *Leonids* shower 0300–1000 UTC. On 144.200 MHz all Europe was on. It sounded like 14 MHz on a contest day. It was very difficult to hear a guy in the pile-ups. Many stations answered at the same time on the frequency with the same report. My sincere apologies for not answering sometimes. The shower was comparable in 1998, but appeared at right hours. Bursts were very long and relayed by a constant ionization of *E* layer.

"For me, I remember 1965 and 1966, except at that time there were not as many stations. No doubt there has been progress. Hope to be alive in 33 years for my third maximum, hi!"

Ed Stallman, N5BLZ: "Had a great time working the *Leonids*. I have not worked meteors since the mid 1980s when I was chasing states. I have never heard anything like this. The band was full from 144.180 to .220, and .200 was a mad house. I thought I would be in front of the radio for an hour or so. Wrong! I started at 0900 and finished at 1900 UTC.

"I made 66 QSOs all random on SSB. They included 24 states, 52 grids, and 4 VEs. My best DX was EL29 to FN13, 2238 km."

David Anderson, GM4JJJ: "The band was full in EU also, from 144.150 to 400 MHz. As usual, 144.200 MHz was crazy here.

"It was amazing to find that in the midst of all of this there were folks who seemed unaware that there was this fantastic propagation going on. I could hear locals talking amongst themselves both in the UK and the continent.

"There seemed to be a contest on in OK, because I worked a number of stations there who wanted to exchange contest serial numbers and grids as well as reports! Great fun. One new DXCC for me, ISØ."

Andy Clarke, VA6SZ: "It was an incredible weekend on 6 meters, November 16, 17, and 18, 2001. It seems the *Lenoids* meteor shower on the 18th in addition to the aurora that happened Saturday night made conditions on 6 meters almost like 10 meters or 15 meters. The band was open around the clock from Friday evening until Sunday evening. The statistics were: 367 QSOs with 37 grids, 18 states, 2 provinces, 1 territory, and 8 countries worked (KH6, V73 [×2], JA, XE1, ZF1, KL7, and VK4. Also Guam was heard but not worked.)"

Pat Fridenstine, W8PAT: "I planned to spend most of the time on 222 MHz. I had three skeds. At 0830 UTC on 144 MHz via a sked I worked CO2OJ EL83ta on WSJT in 23 minutes for a distance of 1918 km. At 0900 on 222 MHz via a sked I worked W5UWB EL17ax on SSB in 20 minutes via a big burn for a distance of 2057 km. At 0935 on 222 MHz I heard WD5AGO EM26. At 1000 I woke up my wife and son and watched the fireworks fall and took some pictures. I didn't enter the time, but on 222 MHz I worked W5RCI EM44. At 1130 on 144 MHz via an internet WSJT sked I worked VE5UF DO61ov on WSJT in 20 minutes via a long burn for reports for a distance of 2207 km.

"At 1200 I milked the cows and did other chores. Later I came in and worked DX on 6 meters, including HR1BY, for country number 89, but I just couldn't get any propagation to any other new ones. At 1725 on 222 MHz I worked K5UGM EM12. I heard him many times. At 1757 on 222 MHz I worked K5YT EM12. Then at 1810 on 222 MHz I worked WB5AFY EM04. I tried an internet WSJT sked on 222 MHz at 1845 222 MHz with N5OSK, but the rocks were too far west by then.

"Summary: One new country per band on 144 and 50 MHz, two new states on 222 MHz, and my longest 222 and 144 MS QSOs. Not a bad day, but boy was I tired!"

Don Ross, NL7CO: "Now I remember what a kid feels like on Christmas Eve. The fun started for me at 0715Z and lasted until 1136Z—basically 4 hours of continuous pile-ups and hasty attempts at schedules set up on the prop logger. At the end I was so tired that I couldn't remember my own grid.

"It was sunrise, the bands were dying, and Jim Kennedy, WH6LR, and I were tired, hoarse, and hungry, so we went down to one of the local restaurants for an omelet and a review of the evening. At that time, I had worked 19 new grids and 14 new states and was feeling proud of myself because my goal had been 10 grids and 4 states.

"Jim had added new grids and states on both 2 meters and that other band (6 meters). I went home and took a nap before getting up and finding that the rocks were still roaring, and in the next two hours before they really died, I added 18 more grids and 5 more states. "I hope everyone had as much fun as I did!"

Mike King, KMØT: "Things went very well here for me. I managed to pick up VT on early Saturday morning via WSJT (N1JEZ—thanks, Mike!) for state number 47. He is QRV on WSJT and should make lots of folks happy for upcoming contacts from that state on that mode.

"All the e-mails and coordination sent out looking for operators in the state of Delaware did not come together. I did get responses from a few, but stations were either down for the time being or other reasons.

"I sent one more e-mail to 'Brian the Rover,' ND3F, and he said he would take his rover with stacked Yagis out just 'across the border' for the night. Brian and I completed for state number 48. So my quest to work the lower 48 without EME was done; took about 3 years! Thanks, Brian! VT and DE took the last 1.5 years! I'm sure Brian will be there again someday in DE. Word has it he may be bringing along WSJT.

"Even though completing WAS during the shower was exciting, it gets better. For some time I have been participating in the CSVHF States Above 50 MHz operating event. It runs from July 1st to the end of June. So July 1st I was at zero states on 2 meters as the event began. *(See <http://www.csvhfs.org/CSTEST0.HTML> for more info on this operating event.—ed.)*

"The first four or five months went very well on 2 meters for that award. I had 40 states for the year so far before the *Leonids* shower. I managed to get a lot of states via tropo, AU, and meteor scatter. WSJT was dominant during the *Perseids* shower, where I picked up a large number of states. I did work RI on HSCW during the *Perseids* as well. It had been an exceptional first number of months.

"Working Mike in VT was number 41 for the year on the 17th. Before the rocks really began in the early evening of the 18th, KK4TE came blasting through and I picked up Alabama for number 42 for the year.

"Brian in DE got me to 43 for the year. At that point I decided to concentrate on the last states I needed, thinking I could get 'just a few more.' As luck would have it (and it was a lot of luck for sure) things just fell into place.

"The rocks were very intense to the SW for quite some time, the calling frequency was a madhouse, and I decided to slide down 3 kc. I called CQ a few times and worked NW7O for Nevada. Viva Las Vegas! What a surprise that was, as I never even knew that he was on. Right after that I worked California as well.

"Then, I saw a post that K1MS in Massachusetts was calling on 144.125. I tuned down there and swung the beam around. Almost immediately I heard him on a super long burn. I dumped my call and grid and we completed without any effort. I never thought I would work MA again; never heard anyone was there except when Steve Harrison, KØXP, was active there a few years ago.

"I had SC and TN to go. Again, as luck would have it, Gary Flynn, KE8FD, posted to the 144 prop logger to meet on 144.220. Sure would be nice to work Gary again. I knew he had moved from his Ohio QTH last year but I did not remember where. I looked it up quickly and wow! He was in SC at the new QTH! We met and worked almost immediately as well. Thanks!

"That left TN to go. I posted that I was looking for TN and got a response back from Bill Perry, W4HP, in EM75. We met on 144.225 and worked with a bit of difficulty because it seemed that the burns were more of backstatter then direct at that short a distance. Thanks much, Bill!

"So there it was. I finished up with 48 states non-EME for the CSVHF event, from July 1 to Nov 18th. Last year I had 34 states on 2 meters. A final tally of the propagation modes indicates the following: sporadic-*E,* 2; SSB meteor scatter, 12; WSJT metwor scatter, 13; HSCW meteor scatter, 1; aurora, 3; and tropo, 17. Never in my wildest dreams would I have thought this would happen to me! In total I worked about 20 stations, not a large number by any means. But with the hunting and pouncing I was doing, did not work a large number. My guess is that I could have worked a large number of folks.

"For those of you who need IA, I can now concentrate on schedules of WSJT and SSB, etc., as you wish. Sorry I was not more available, but I really wanted to concentrate on this 'lower 48' thing before I may have to leave this QTH and start all over again."

Larry Murdoch, K6AAW: "It was a bit dismal on WSJT. I tried too many long ones, and program locked up on run time errors, so I worked only two stations on WSJT. On SSB I made 56 QSOs in 37 grids; three countries—VE4, XE2, W/K. I worked six new grids, which is a lot being at 318, and a super lot for having my back up against an ocean, and not much south; hi.

"My longest DX was 1400 miles and the shortest was 220 miles on backscatter! My most exciting QSO was with Chuck, W7CS. I called him at 1624 UTC and the QSO rolled on and on, with others breaking in and both of us working them. On and on, us taking turns CQing and working stations, periodically asking each other, 'Are you still there, Chuck?' 'Yes!' Then, a few minutes later, 'Are you still there, Larry?' 'Yes!' This lasted until 1640! Was this a giant blue whizzer of all time or a 16 minute "E cloud"? E-mail Chuck if you are an unbeliever; hi.

"A few postscripts: First, 20 of these stations were worked away from 144.200 MHz. They were worked on .205, .208, .210, .195, and yes, congratulations to NØPOH, who was on .185 and NØKM, way down on .180. Super thanks to N6CL and W3EP for their articles urging people to spread out. Your articles worked!

"Second, I never called CQ or mentioned my call at any time within 5 kHz of .200 after the shower started at 1000 UTC here. All of my QSOs were random except one sked.

"Finally, you may be interested in trying to find the peaks by collecting times in order to determine the peak. I was by the radio continuously from 0800 to 2100 and I vote for 1620–1800 as the peak."

Dan Feeback, W5DF: "John Maca, AB5SS, and I operated during the *Leonids* from W5RRR at NASA Johnson Space Center on both 2 and 6 meters. We didn't make a whole lot of contacts, but we did have a whole lot of fun. Greatest activity seemed to be between 9:45 and 10:30 UTC. We were

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able to hear and work both coasts at the same time for a brief period. Thanks to all the stations that were active during the very early morning hours. It was a blast."

Mike Farrell, VK2FLR: "Here is a list of VK stations who made it via the *Leonids* on 144 MHz. The shower peaked between 1700 and 1800 UTC with a ZHR approaching 3000. Audio clips from the event are at <http://www.minecost.com/hamstuff/>.

"The final score is: VK1, 2; VK2, 15; VK3, 36; VK4, 17; VK5, 8; VK6, no reports; VK7, 3; and VK8 and VK9, no reports. Two non-VK stations included ZL and YJ8. The total participants were 83. By callsign, they include: VK1VP, VK1ZQR, VK2BRG, VK2BXT, VK2DVZ, VK2DXE, VK2EI, VK2EM, VK2FLR, VK2KU, VK2MP, VK2OM, VK2TK, VK2TP, VK2TQP, VK2ZAB, and VK2ZCV.

"Also active were: VK3AEF, VK3AFW, VK3AG, VK3AJH, VK3AKK, VK3AL, VK3AMK, VK3AXH, VK3BDL, VK3BJM, VK3BRZ, VK3CAT, VK3CSJ, VK3DMW, VK3DUT, VK3EK, VK3FIQ, VK3FMD, VK3GRL, VK3HY, VK3JEG, VK3KAI, VK3KEG, VK3KME, VK3KQB, VK3KWA, VK3RGL/B, VK3TDV/2, VK3TMP, VK3TV, VK3UM, VK3WRE, VK3XPD, VK3YB, VK3YY, and VK3ZLS. Plus: VK4ABW, VK4AFL, VK4AJS, VK4AML, VK4BLK, VK4DFE, VK4EM, VK4FNQ, VK4KK, VK4KZR, VK4LC, VK4LK, VK4OE, VK4QV, VK4RTT/B, VK4TZL, VK4WDN, VK5DK, VK5GN, VK5KK, VK5NQ, VK5NY, VK5RO, VK5ZBK, VK5ZUC, VK7JG, VK7KBB, VK7MO, YJ8UU, and ZL1IU."

Dan Osborne, WB5AFY: "I had a good time here in EM04 on 222 MHz, with six new states and 10 new grids. I observed that VE3AX would be in here for 2–4 minutes at a time at 20 dB over 9—kinda neat! QRM on 222.100 is not something that is normally a problem down here. My station on 222 MHz is a homebrew transverter (*a la* W5LUA/W1JR/WA5VJB), Collins S-line 75S3B/32S1 IF, 8877 W6PO amp, and M^2 7WL at 40 feet or so. I even use a Westcom noise blanker on my 28 MHz IF. It works great!"

Ray Veldran, K4ZOO: "It all started with you (N6CL). Beginning at 0631 UTC on 144 MHz, N6CL EM26, KK4TE EM50, NØBQV EM27, NØPB EM39, KB5EM EM42, KB5FTW EM12, NØKQY DM98, K5MQ EM31, K5QE EM31, and WD5AGO EM26.

"Then on 222 MHz, WD5AGO EM26, WB5AFY EM04, again WD5AGO EM26, W5RCI EM44, K5UR EM35, again K5UR EM35.

"Going back to 144 MHz, I worked NTØV for a new state. Back on 222 MHz I worked NØKQV DM98, again WD5AGO EM26, and again WB5AFY EM04. Then I worked K5SW EM25. Back on 144 MHz I worked K9IMX EM38, N9BZ EM49, K5SW EM25, N5BLZ EL29, again K5QE EM31, and again going to 222, I again worked W5RCI EM44 and wrapped things up at 1550 UTC by working WD5AGO EM26.

"All in all, it was not bad—best meteor shower in a while. I completed QSOs with one new state on 144 MHz (NTØV EN08) and three new grids. On 222 MHz I completed QSOs five new states and six new grids."

John Butrovich, W5UWB: "Not much to report from EL17ax, as I spent most of my time on 222 MHz with some very, very long haul skeds, none of which panned out.

"The stations I ran with but did not complete included: K2ERG at 1600+ miles; K4RTS; VE3AX at 1400+ miles, with two great 6 second bursts, but could not complete; K7ICW at 1200 miles, with 5 minutes of good bursts, but could not complete. The only success was with W8PAT, 1170 miles at 0900 UTC, which was completed within 20 minutes. He was running only 60 watts.

"Later I jumped down to 144 MHz and looked for a few randoms. Worked the following: K5UXN DM43, AE7H DM44, WA6TFZ DM15, and K6JEY also in DM15."

Gene Zimmerman, W3ZZ: "The following is my *Leonids* summary: 48 Q's in 19 states and 42 grids. Given the good weather I was in the process of rehabbing my antennas/feedlines that weekend. I managed to get the 17B2 back up in time but could not rotate it so it was left at about 240 degrees. So my results to the northwest and to FL were pretty scanty. I began at 0900 UTC and ended at 1400 UTC, when I returned to working on the antennas.

"Here are the stations I worked: K5SW EM25, W5SZ EM04, KM5ES EM25, NØKQY DM98, KC8OKJ EM89, W7XU EN13, KQ4E EM86, KK4TE EM50, WØGHZ EN34, K5QE EM31, WO4DX EM74, KJ5RT EM04, WA5RT EL49, KG4BMH EM75, N5TIF EM12, K4AR EM76, WA4CQG EM72, WA3GWK EM64, K9IMX EM38, KF4DGS EM53, WA4HFN EM55, KU4WW EM54, and NW5E EL96.

"Also worked were: NL7CO EM04, N6CL EM26, KV4T EM53, K5JL EM15, AA8Q EM79, K5YY EM35, W5MB EM13, N5BLZ EL29, N9NJY EM58, K5UR EM34, NEØP EN41, WØRT EM27, K4TO EM77, N5YT EM33, W4ZRZ EM63, KD4ESV EL87, K9KJM EN64, KE8FD EM84, WØRRY EM26, WI9I EM59, N5WS EL09, W4UDH EM52, KG5MD EM36, KØDAS EN42, and AG4V EM55.

"As luck would obviously have it, 17 and 18 November were perhaps the best days in history on 6 meter *F2*, but that is another story. Since the last week of October I have worked 16 new countries and now just await the mail each day as I collect enough cards to confirm DXCC. Four to go (116/96)."

Bernie Gapinski, DK3XT/AB7IY, wrote that he has a bunch of European *Leonids* reports posted on his website, <http://www.meteorscatter.net/leo2001.htm>. The reports include logs and comments from OK8K, LY2SA, PE1OGF, G4ASR, EA3DXU, YO3FFF, I4XCC, DL8EBW, GØXDI, F6HVK, and OM3TZZ, as well as the VK3UM report listed above. They prove fascinating reading both for the comments and the extensive activity that took place in Europe during what was predicted to be a non-event.

Your editor completed about a dozen QSOs in about a half-dozen new states. (They all are new, as I am starting over from my old QTH of Oklahoma City).

Comments due February 12 in "Band Threat" Proceeding

The following is from the "ARRL Letter," Vol. 20, No. 47:

Comments are due February 12, 2002, in an FCC Notice of Proposed Rule Making and Order, ET Docket 01-278, that ARRL has targeted as a potential band threat. Reply comments are due on March 12, 2002. The proceeding deals in part with a potential threat to the popular 70 cm band from Part 15 RF identification devices proposed for deployment between 425 and 435 MHz.

SAVI Technology, which markets radiolocation and wireless inventory control products, told the FCC it needs the rules changes to satisfy customer demand for increased RFID system capabilities. The FCC has proposed to allow operation of RFIDs as unlicensed Part 15 devices in the 425–435 MHz band with transmissions of up to two minutes at field strengths now only permitted for extremely short-duration, intermittent control signals.

The ARRL has argued that under the Communications Act of 1934 the FCC lacks authority to permit unlicensed devices with substantial interference potential and that such devices must be licensed. The League also is looking into the interference potential posed to 20 meters by a proposal to increase the maximum emission levels permitted by Part 15 devices operating at 13.56 MHz, as well as the maximum level of out-of-band emissions.

"Commenters are advised to read paragraphs 20-27 of the NPRM&O, available on the ARRL website: <http://www.arrl.org/news/stories/2001/10/19/1/290a11.html>. Interested parties may file comments using the FCC's Electronic Comment Filing System: <http://www.fcc.gov/e-file/ecfs.html> (search using "01-278"). Commenters should include full name, U.S. Postal Service mailing address, and applicable docket or rulemaking number, in this case ET 01-278.

It's also possible to e-mail comments via the ECFS. To obtain e-mail filing instructions, commenters should send an e-mail to <ecfs@fcc.gov> and include the words "get form <your e-mail address>" in the body of the message. A sample form and directions will be sent by reply e-mail."

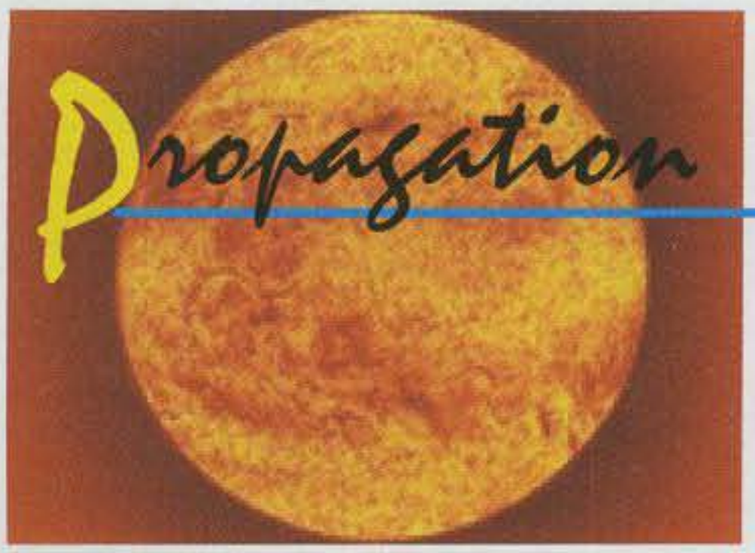
And Finally . . .

At about the time I was trying to gather *Leonids* reports, I found out that the e-mail service I was using to receive the <n6cl@cq-amateur-radio.com> forwarder went out of business. I have since subscribed to another service and all is working well.

Moon apogee is February 15th, three days after New Moon. In additional, the lowest declination of the month is on the 16th, which means that EME conditions will be lousy. I predict that other forms of weak-signal propagation might not be that good, as well. Therefore, it would be a good time to take your spouse or significant other out on a special date the day before (Valentine's Day). I plan to do something special for Carol, as it will be our 4th wedding anniversary.

Thank you for all of the reports you have sent in. The 6 meter *F2* reports hopefully will be published next month. Until then . . .

73, Joe, N6CL



Propagation

BY TOMAS HOOD, NW7US

The Science Of Predicting Radio Conditions

CME Shock Wave Starts Off CQ WW CW 2001
Double Solar Peak Possible

CQ WW CW Conditions

The 2001 CQ World-Wide DX CW Contest weekend of November 24–25 was plagued by severe geomagnetic storminess (as predicted by W3ASK in this column in the December issue), with an *Ap* of 108 on the 24th and 8 on the 25th. The onset of storm conditions began with two sudden shock passages which enhanced already high geomagnetic activity. Between 6 and 18 UTC on the 24th severe storm conditions degraded HF communications. The storm was the result of three separate shock waves from coronal mass ejection (CME) events during November 21–23 which had merged into a single very strong shock wave hitting the Earth's magnetosphere on the 24th. Contest participants got a chance to see how well Morse Code "makes the grade" under harsh conditions. The application of skill and dedication will be revealed in the results of the contest. Check out the "Contesting" column for more on the CQ WW CW Contest.

Storm conditions due to the passage of a CME shock wave kicked off the 2001 CQ WW DX CW Contest. Contesters in higher latitudes suffered on the HF bands, but by the second day conditions improved. Table I summarizes the key geomagnetic, solar, and ionospheric data recorded during the contest.

While the contest weekend saw a severe storm, moderate to excellent conditions existed for the rest of November. There were many exciting *F*-layer openings on 6 meters, as well as the rest of the HF bands. On 6 meters hot east/west paths opened up, enabling me to experience voice communication from my QTH in Washington state to many east coast and southern grids. I worked a great number of stations while either mobile or at home. While mobile I use a simple 6 meter vertical mobile antenna. When at home I use a 20 meter quarter-wave groundplane antenna made up of a Hustler 20 meter coil, a 30 foot mast to raise it above the house, and radial wires. This is tuned for 6 meter operation through an MFJ Versa Tuner. I use lossy coax. This translates to having less than 15 watts radiated power on 6 meters. Nevertheless, I worked stations thousands of miles away using the *F*-layer propagation mode on the magic band. Imagine what you can do if you have a real 6 meter beam or vertical.

When the *F*-layer propagation opens for the frequency you are using, it does not require an expensive, elaborate station. The 6 meter *F*-layer openings came about after many consecutive days with a solar flux greater than 200 and low geomagnetic activity. In 1999 there were 13 days when the solar flux was above 200 (November 9–21). In 2000 there were only 4 days when the flux was above 200 (November 1, 23, 25, and 26). However, between October 16 and November 16, there were 16 days of a solar flux above 200! Throughout February look for days with a solar flux greater than 200, with very low *Ap* numbers. The longer the run of these high-flux days, the more chance of an Above Normal *F*-layer opening on 6 meters. If you have a 6 meter radio capable of USB and/or CW operation, keep your 6 meter radio tuned to 50.125 during these periods. You just might work *F*-layer propagation. *(Tune around if you can. Many DX stations avoid the U.S. calling frequency—ed.)*

As February draws to an end, so too will the 6 meter *F*-layer paths. However, with the higher *Ap* numbers during spring and summer, you will find sporadic-*E* propagation providing paths to closer stations in nearby states and grids. March and April are months when aurora openings occur, so even as February's *F*-layer openings decrease, you will still have plenty of fun with the other propagation modes.

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for February 2002

	Expected Signal Quality			
Propagation Index.....	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 1-7, 14, 19-23, 25, 28-31	**A**	**A**	**B**	**C**
High Normal: 8-10, 13, 15-16, 18, 24, 26	**A**	**B**	**C**	**C-D**
Low Normal: 11-12	**B**	**C-B**	**C-D**	**D-E**
Below Normal: 27	**C**	**C-D**	**D-E**	**E**
Disturbed: 17	**C-D**	**D**	**E**	**E**

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9+, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.

2. With the *propagation index,* use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be excellent (A) on Feb. 1-7, good (B) on Feb. 8–10, fair-to-good (C–B) on Feb. 11–12, etc.

Geographical Area	November 24	November 25
Polar	Disturbed	Below Normal
Auroral	Disturbed	Below Normal
Middle Latitude	Disturbed/Low	Below Normal/Low
Low Latitude	Disturbed/Low	Low Normal
Equatorial	Low Normal	High Normal
10.7 cm Radio Flux	173	170
Daily Sunspot Number	124	102
WW Geomagnetic *Ap* Index	108	8
WW Geomagnetic *Kp* Index	6	2

Table I– Summary of HF propagation conditions based on reports from NOAA during the CQ WW DX CW Contest weekend of November 24–25, 2001.

P.O. Box 213, Brinnon, WA 98320-0213
e-mail: <cq-prop-man@hfradio.org>

To make an exciting time even more memorable, I also experienced *E*-layer and backscatter openings on 6 meters during November 2001. The fun did not end there, though. November was the month of the *Leonids* meteor shower, and the 2001 shower was heavier than those of recent years, providing great visuals of fireballs and shooting stars. I have heard many tales of adventurous amateur radio operators with massive, complex antenna arrays and exceptional Morse Code skills working the infamous meteor-mode propagation. They bounce their signals to each other off ionized trails left by passing meteors.

Trying my luck—using the inadequate 20 meter vertical antenna at home and an ICOM IC-706MKIIG—I tuned around the calling frequency of 50.125 USB. I heard signals! I made a short voice contact with three separate stations, each in three different grids. Two of these were located in California and one in Montana. These contacts were in USB voice and were via this exciting meteor mode. If I can do it, you can, too. For details, read the "VHF Plus" column by Joe Lynch, N6CL.

It Looks Like A Double Header

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly-observed mean sunspot number of 106.5, a 10.7 cm monthly-observed mean solar flux of 212.5, and an observed monthly mean *Ap* index of 14 for November 2001. The sunspot low for the month was 67 on November 24. The sunspot high of 152 occurred on November 8.

The smoothed running sunspot number centered on April 2001 was 107.6 and centered on May 2001 was 108.7. These are up from March's 104.8, showing a possible second peak in the cycle. It looks as if this cycle has a lot of play left before it declines. A smoothed sunspot level of 100 and a 10.7 cm solar flux of about 159 are predicted for February 2002, but expect days when the flux will rise above 200.

HF Propagation

Daytime MUFs start to drop in March and April, so take advantage of February's unique position between the high MUFs and low geomagnetic numbers of winter and the low MUFs and high geomagnetic activity of summer. The sunspot count is expected to remain near peak levels throughout the month, with geomagnetic activity quiet to unsettled. During the daylight hours of February expect good to excellent

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings. An ** indicates best time to check for 6 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *standard* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

February 15 - April 15, 2002
Time Zone: EST (24-Hour Time)
EASTERN USA To:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-11 (1) 11-13 (2) 13-14 (1)	07-08 (1) 08-09 (3) 09-12 (4) 12-13 (3) 13-15 (2) 15-16 (1)	04-07 (1) 07-09 (4) 09-12 (3) 12-15 (4) 15-17 (3) 17-19 (2) 19-21 (1)	17-19 (1) 19-20 (2) 20-01 (3) 01-02 (2) 02-03 (1) 19-21 (1)* 21-22 (2)* 22-23 (3)* 23-00 (2)* 00-01 (1)*
Northern Europe & European CIS	08-12 (1)	07-08 (1) 08-11 (2) 11-14 (1)	05-07 (1) 07-09 (3) 09-11 (2) 11-13 (3) 13-14 (2) 14-18 (1)	18-20 (1) 20-22 (2) 22-02 (1) 20-00 (1)*
Eastern Mediter-anean	09-13 (1)	08-09 (1) 09-11 (3) 11-13 (2) 13-15 (1)	07-09 (2) 09-12 (1) 12-14 (2) 14-16 (1) 16-18 (3) 18-22 (2) 22-23 (1) 04-07 (1)	19-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
East Africa	10-13 (1) 13-15 (2) 15-16 (1)	07-08 (1) 08-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-18 (2) 18-21 (3) 21-23 (2) 23-01 (1)	19-00 (1) 21-23 (1)*
West & Central Africa	11-14 (1) 14-16 (2) 16-17 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-14 (4) 14-16 (3) 16-17 (2) 17-19 (1)	07-09 (2) 09-12 (1) 12-13 (2) 13-15 (3) 15-18 (4) 18-19 (3) 19-22 (2) 22-07 (1)	18-20 (1) 20-22 (2) 22-01 (1) 21-23 (1)*
South Africa	10-11 (1) 11-12 (2)	07-09 (1) 09-13 (2)	05-14 (1) 14-16 (2)	21-23 (1) 23-00 (2)
	12-14 (1)	13-15 (3) 15-17 (2) 17-18 (1)	16-18 (3) 18-20 (2) 20-23 (1) 23-01 (2) 01-03 (1)	00-01 (1) 23-01 (1)*
Central & South Asia	*Nil*	07-09 (1) 18-20 (1)	07-10 (1) 19-22 (1)	05-07 (1) 19-21 (1)
Southeast Asia	*Nil*	07-09 (1) 18-20 (1)	06-07 (1) 07-09 (2) 09-10 (1) 19-21 (1)	06-08 (1) 17-20 (1)
Far East	17-19 (1)	07-09 (1) 16-17 (1) 17-19 (2) 19-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-20 (1) 20-22 (2) 22-00 (1)	05-08 (1) 06-07 (1)*
Guam & Pacific Islands	13-15 (1) 15-17 (2) 17-18 (1)	12-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	01-07 (1) 07-10 (2) 10-19 (1) 19-01 (2) 01-04 (1)	00-02 (1) 02-06 (3) 06-07 (2) 07-08 (1) 02-03 (1)* 03-05 (2)* 05-06 (1)*
Australia & New Zealand	16-18 (1)	08-12 (1) 15-17 (1) 17-20 (2) 20-22 (1)	00-03 (2) 03-07 (1) 07-09 (3) 09-10 (2) 10-13 (1) 13-15 (2) 15-19 (1) 19-22 (2) 22-00 (3)	03-05 (1) 05-07 (2) 07-09 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Northern & Central South America	08-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-18 (1)	07-08 (1) 08-11 (3) 11-14 (2) 14-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	00-03 (2) 03-06 (1) 06-07 (2) 07-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-22 (4) 22-00 (3)	18-19 (1) 19-20 (2) 20-03 (3) 03-05 (2) 05-07 (1) 19-21 (1)* 21-02 (2)* 02-06 (1)*
Southern Brazil, Argentina, Chile & Uruguay	09-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-18 (1)	07-08 (1) 08-10 (3) 10-15 (2) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	04-06 (1) 06-08 (2) 08-15 (1) 15-16 (2) 16-17 (3) 17-19 (4) 19-01 (3) 01-04 (2)	19-21 (1) 21-03 (2) 03-07 (1) 21-06 (1)*
McMurdo Sound, Antarctica	11-13 (1) 13-16 (2) 16-18 (1)	08-10 (1) 15-17 (1) 17-19 (2) 19-21 (1)	04-07 (1) 07-09 (2) 09-12 (1) 15-18 (1) 18-21 (2) 21-00 (3) 00-04 (2)	23-05 (1)

Time Zones: CST & MST
(24-Hour Time)
CENTRAL USA To:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-12 (1)	07-08 (1) 08-09 (2) 09-12 (3) 12-14 (2) 14-15 (1)	05-07 (1) 07-09 (3) 09-11 (2) 11-14 (3) 14-17 (2) 17-20 (1)	17-19 (1) 19-22 (2) 22-02 (1) 20-21 (1)* 21-22 (2)* 22-00 (1)*
Northern Europe & European CIS	08-11 (1)	07-09 (1) 09-11 (2) 11-13 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-17 (1)	19-01 (1) 20-23 (1)*
Eastern Mediter-ranean	09-12 (1)	07-09 (1) 09-12 (2) 12-14 (1)	23-02 (1) 07-12 (1) 12-17 (2) 17-22 (1)	19-23 (1) 20-22 (1)*
East Africa	10-15 (1)	07-10 (1) 10-15 (2) 15-17 (1)	06-12 (1) 12-17 (2) 17-20 (3) 20-21 (2) 21-23 (1)	19-21 (1) 20-22 (1)*
West & Central Africa	11-13 (1) 13-15 (2) 15-16 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-18 (1)	07-12 (1) 12-13 (2) 13-15 (3) 15-17 (4) 17-20 (2) 20-00 (1)	18-19 (1) 19-21 (2) 21-00 (1) 20-22 (1)*

Visit Our Web Site

South Africa	10-13 (1)	07-09 (1) 09-13 (2) 13-14 (3) 14-16 (2) 16-17 (1)	05-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-21 (1) 00-02 (1)	23-00 (1) 23-00 (1)*
Central & South Asia	17-19 (1)	07-10 (1) 18-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-22 (1)	06-08 (1) 19-21 (1)
Southeast Asia	09-11 (1) 16-19 (1)	08-11 (1) 16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-12 (1) 17-18 (1) 18-10 (2) 20-22 (1)	06-08 (1) 17-19 (1)
Far East	15-18 (1)	07-09 (1) 14-16 (1) 16-19 (2) 19-21 (1)	07-09 (2) 09-11 (1) 17-20 (1) 20-00 (2) 00-07 (1)	02-05 (1) 05-07 (2) 07-09 (1) 05-07 (1)*
Guam & Pacific Islands	12-15 (1) 15-17 (2) 17-19 (1)	10-13 (1) 13-16 (2) 16-19 (3) 19-20 (2) 20-21 (1)	06-07 (2) 07-09 (3) 09-11 (2) 11-18 (1) 18-20 (2) 20-22 (3) 22-00 (2) 00-06 (1)	22-01 (1) 01-06 (3) 06-07 (2) 07-09 (1) 00-03 (1)* 03-06 (2)* 06-07 (1)*
Australia & New Zealand	15-17 (1)	09-12 (1) 12-17 (2) 17-19 (3) 19-20 (2) 20-22 (1)	07-09 (2) 09-17 (1) 17-20 (2) 20-00 (3) 00-03 (2) 03-07 (1)	02-04 (1) 04-07 (2) 07-09 (1) 04-05 (1)* 05-07 (2)* 07-08 (1)*
Northern & Central South America	09-11 (1) 11-13 (2) 13-14 (3) 14-15 (2) 15-17 (1)	06-07 (1) 07-08 (2) 08-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	06-07 (2) 07-11 (3) 11-14 (2) 14-16 (3) 16-20 (4) 20-22 (3) 22-02 (2) 02-06 (1)	18-19 (1) 19-20 (2) 20-02 (3) 02-04 (2) 04-06 (1) 20-21 (1)* 21-02 (2)* 02-06 (1)*
Southern Brazil, Argentina, Chile & Uruguay	08-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-18 (1)	07-08 (1) 08-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-08 (2) 08-15 (1) 15-16 (2) 16-18 (4) 18-22 (3) 22-04 (2) 04-06 (1)	19-22 (1) 21-03 (2) 03-06 (1) 21-05 (1)*
McMurdo Sound,	11-13 (1) 13-15 (2) 15-18 (1)	13-16 (1) 16-18 (2) 18-20 (1)	07-09 (2) 09-12 (1) 15-18 (1) 18-20 (2) 20-23 (3) 23-03 (2) 03-07 (1)	00-06 (1)

Time Zone: PST (24-Hour Time)
WESTERN USA To:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-11 (1)	08-10 (1) 10-12 (2) 12-15 (1)	23-01 (1) 06-08 (1) 08-12 (2) 12-14 (3) 14-16 (2) 16-20 (1)	18-00 (1) 20-22 (1)*
Northern Europe & European CIS	*Nil*	08-12 (1)	23-01 (1) 06-07 (1) 07-09 (2) 09-13 (1)	19-23 (1) 20-22 (1)*
Eastern Mediter-ranean & East Africa	*Nil*	07-11 (1)	06-09 (1) 09-11 (2) 11-15 (1) 18-21 (1)	18-21 (1)
West & Central Africa	11-16 (1)	06-08 (1) 08-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	05-10 (1) 10-15 (2) 15-18 (3) 18-20 (2) 20-22 (1)	18-22 (1) 19-21 (1)*
South Africa	10-13 (1)	08-10 (1) 10-14 (2) 14-16 (1)	05-14 (1) 14-16 (2) 16-18 (3) 18-20 (1) 00-02 (1)	19-22 (1) 20-21 (1)*
Central Asia	17-19 (1)	07-09 (1) 16-17 (1)	06-07 (1) 07-09 (2) 17-19 (2) 19-21 (1)	05-08 (1) 09-11 (1) 17-19 (1) 19-20 (2) 20-22 (1)
Southeast Asia	16-19 (1) 09-11 (1)	08-09 (1) 09-10 (2) 10-14 (1) 14-17 (2) 17-18 (3) 18-19 (2) 19-21 (1)	07-08 (1) 08-10 (3) 10-11 (2) 11-21 (1) 21-00 (2) 00-02 (1)	00-02 (1) 02-06 (2) 06-08 (1) 02-06 (1)*
Far East	14-15 (1) 15-16 (2) 16-18 (1)	12-14 (1) 14-18 (2) 18-20 (3) 20-22 (1)	08-10 (2) 10-20 (1) 20-22 (2) 22-00 (3) 00-04 (2) 04-08 (1)	00-02 (1) 02-06 (2) 06-08 (1) 02-08 (1)*
Guam & Pacific Islands	12-15 (1) 15-17 (2) 17-19 (1)	08-12 (1) 12-16 (2) 16-17 (3) 17-18 (4) 18-20 (3) 20-21 (1)	09-10 (2) 10-12 (4) 12-16 (3) 16-19 (4) 19-20 (3) 20-00 (2) 00-09 (1)	19-20 (1) 20-22 (2) 22-06 (4) 06-08 (2) 08-09 (1) 21-23 (1)* 23-06 (2)* 06-07 (1)*
Australia & New Zealand	11-15 (1) 15-17 (2) 17-18 (1)	10-12 (1) 12-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-17 (1) 17-18 (2) 18-20 (3) 20-22 (4) 22-00 (3) 00-02 (2) 02-04 (1)	00-03 (1) 03-05 (3) 05-07 (2) 07-08 (1) 02-03 (1) 03-05 (2) 05-07 (1)
Northern & Central South America	10-12 (1) 12-14 (2) 14-16 (1)	06-07 (1) 07-08 (2) 08-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (2) 07-09 (3) 09-10 (2) 10-14 (1) 14-16 (2) 16-18 (4) 18-22 (3) 22-00 (2) 00-06 (1)	18-20 (1) 20-00 (3) 00-03 (2) 03-05 (1) 20-21 (1)* 21-01 (2)* 01-04 (1)*
Southern Brazil, Argentina, Chile & Uruguay	08-12 (1) 12-13 (2) 13-15 (3) 15-16 (2) 16-18 (1)	00-02 (1) 07-11 (1) 11-13 (2) 13-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	20-05 (2) 05-15 (1) 15-16 (2) 16-18 (4) 18-20 (3)	18-19 (1) 19-23 (2) 23-03 (1) 20-02 (1)*
McMurdo Sound, Antarctica	11-13 (1) 13-15 (2) 15-17 (1)	12-15 (1) 15-18 (2) 18-20 (1)	05-06 (1) 06-08 (2) 08-11 (1) 16-19 (1) 19-20 (2) 20-23 (3) 23-02 (2) 02-05 (1)	00-06 (1)

**Indicates best times to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.*
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.
Propagation charts prepared by George Jacobs, W3ASK.

conditions on six bands. Fifteen meters is expected to be the hottest band between just after sunrise and an hour or so after sunset, with 10, 12, and 17 meters acting much the same. Stronger storming and disturbances will increase after February, with 160 and 80 meters becoming ever more noisy, while 40 will still offer great nighttime DX. However, don't be surprised by unexpected 160 meter DX openings, especially around sunset and sunrise. Look for 20 meters to provide many 24-hour periods of DX. Expect path openings to switch from east/west to north/south, especially for the daytime bands—10, 12, 15, and 17.

Twenty meters will resume all-night propagation. Around mid-afternoon begin looking for DX. Remember to follow the gray-line, where either your station or the DX is at sunrise peaks. As days become longer, the *F*-layer stays ionized between sunset and sunrise, providing 20 meter openings around the clock.

Fifteen meters works much the same way, but does not always stay open. Great over-the-pole propagation exists for 17, 15, 12, and 10 meters. Since we are not yet in the summer months with the higher geomagnetic activity, these polar paths will not be degraded as often as the during the aurora months (March through November). Seventeen and 15 meters should remain open until local midnight.

Nighttime operation should be hot on 40 meters, and the eastern U.S. should be able to work Europe on 80 meters at sunset hours, while the western U.S. should be able to work Pacific DX and beyond at sunrise. Southern states should be able to work long-path signals on 20, 40, and 80 meters.

Maybe that's why there are so many contests scheduled for February. Some of the major ones include the Ten-Ten International Winter SSB Contest (Feb. 2–3), North American Phone Sprint (Feb. 3), Six Club 2nd Winter Contest (Feb. 8–11), the CQ/RJ WW RTTY WPX Contest (Feb. 9–10), FISTS Winter Sprint (Feb. 9), RSGB's 1.8 MHz CW Contest (Feb. 9–10), North American CW Sprint (Feb. 10), QRP ARCI Winter Fireside SSB Sprint (Feb. 10), ARRL International DX CW Contest (Feb. 16–17), and CQ 160 Meter SSB Contest (Feb. 22–24). See K1AR's "Contesting" column this month for more. What will conditions be like for these contests? Check out the Last-Minute Forecast at the beginning of this column to find out.

Look for me on 10 meters voice and CW. I am also active in the Novice CW portion of 40 meters in the evenings and early mornings, as well as on 15 meters in the CW segment of the band during the afternoon.

I look forward to your comments and questions, perhaps some stories (maybe about your 6 meter accomplishments), by either e-mail or old-fashioned letter. Happy DX!

73, Tomas, NW7US

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

SSB RESULTS
QRP/p SECTION
WORLDWIDE

LY5A	**A**	**1,971,592**	**1393**	**646**
		(Op: LY2PAJ)		
PQ2Q	**A**	**1,801,785**	**1135**	**565**
		(Op: PY2WC)		
TI5KD	**A**	**1,488,888**	**1048**	**549**
LY9A	*	1,278,936	1092	558
		(Op: LY3BA)		
TM9K	**A**	**1,206,038**	**1022**	**523**
		(Op: F5BEG)		
K3WW	**A**	**1,091,168**	**863**	**488**
HG5Z	**A**	**1,067,556**	**963**	**497**
		(Op: HA1CW)		
NØKE	**A**	**982,977**	**872**	**471**
YU1KN	**A**	**795,150**	**836**	**465**
KB3TS	*	641,646	616	387
YT1VP	*	477,240	634	388
UA4YJ	**A**	**409,944**	**607**	**348**
VE3BUC	**A**	**395,281**	**508**	**311**
WG1Z	**A**	**319,663**	**450**	**293**
KKØQ	*	310,752	477	312
JR4DAH	**A**	**286,425**	**363**	**285**
RV9UF	**A**	**273,448**	**390**	**266**
YU1LM	*	269,690	469	298
VE6BF	**A**	**260,230**	**371**	**265**
JE7DOT	*	122,485	229	187
NQ7X	**A**	**93,292**	**219**	**166**
RA9XU	*	93,120	213	160
PA3EXS	**A**	**85,470**	**246**	**210**
DK4ARL/M	**A**	**74,202**	**254**	**166**
JA2MWV	*	68,420	217	110
DL1DQY	*	52,000	156	130
GM4ELV	**A**	**45,560**	**156**	**136**
K6III	**A**	**45,141**	**163**	**123**
RABCAH	**A**	**41,000**	**168**	**125**
EA/DL5IAM	**A**	**39,754**	**159**	**139**
K9FOH	**A**	**38,640**	**144**	**115**
JA4AKN	*	37,286	134	103
YO4AAC	**A**	**31,605**	**168**	**129**
W3PO	*	29,568	119	96
GWØVSW	**A**	**27,612**	**145**	**118**
K3PG	*	25,608	119	97
ON7CC	**A**	**17,190**	**101**	**90**
US9QA	**A**	**13,861**	**92**	**83**
RA4AUH	*	10,251	77	67
DL2YET	*	2,046	32	31
F/G3VQQ/P	*	891	27	27
UR5EAW	*	462	13	11
OK1DMP	*	306	9	9
JA5GPJ	**28**	**709,758**	**652**	**387**
UP6F	**28**	**551,551**	**607**	**377**
		(Op: UN7FZ)		
FB1BON	**28**	**470,649**	**545**	**359**
KX9X	**28**	**387,368**	**501**	**328**
NA4CW	**28**	**358,237**	**426**	**319**
JA3LFK	*	222,500	322	250
JL1IHE	*	141,006	250	213
LU2HNP	**28**	**130,810**	**247**	**206**
WA6FGV	**28**	**126,654**	**290**	**209**
N2JNZ	**28**	**107,460**	**217**	**180**
DK3KD	**28**	**81,162**	**193**	**162**
LW7DQW	**28**	**80,848**	**208**	**163**
WR6WR	**28**	**78,200**	**215**	**170**
LU6DTS	*	76,725	183	155
OK2PYA	**28**	**67,815**	**179**	**137**
W7/JR1NKN	**28**	**60,196**	**197**	**149**
ES8AAV	**28**	**51,350**	**163**	**130**
SP4GFG	**28**	**22,410**	**97**	**90**
JI1HFJ	*	21,844	94	86
UR5FCM	**28**	**15,732**	**99**	**76**
OK2ZAW	*	6,950	53	50
OK1AIJ	*	2,720	37	32
RA9UAD	**21**	**420,480**	**547**	**320**
LY5G	**21**	**199,584**	**344**	**252**
		(Op: LY2FE)		
YT7TY	**21**	**104,804**	**278**	**197**
LU5FZ	**21**	**98,532**	**222**	**153**
LU3DR	*	73,312	182	158
JH3DMQ	**21**	**6,612**	**80**	**29**
W6FRH/VE7	**21**	**1,334**	**27**	**23**
UA9AAZ	**14**	**309,319**	**387**	**283**
IU2R	**14**	**83,266**	**190**	**158**
		(Op: IK2BCP)		
W6CN	**14**	**77,056**	**198**	**172**
OK2BAT	**14**	**41,600**	**198**	**160**
BA4TB	**14**	**36,414**	**128**	**119**
K3TW	**14**	**24,360**	**119**	**105**
LU1HN	**14**	**21,896**	**96**	**92**
4NØS	**14**	**17,864**	**128**	**116**
EU6FF	**14**	**11,832**	**100**	**87**
LU6FAZ	*	11,115	69	65
WB7OCV	**14**	**10,336**	**74**	**68**
K7KY	**14**	**6,174**	**64**	**63**
ES6FC	**14**	**3,822**	**100**	**32**
YO6PED	**14**	**3,570**	**54**	**51**
YO9GZU	**7**	**13,464**	**71**	**68**
W6QU	**7**	**10,679**	**66**	**59**
		(Op: W8QZA)		
SP3NGB	**3.7**	**1,794**	**36**	**26**
AM3CKX	**3.7**	**1,508**	**27**	**26**
UA9LAU	**1.8**	**3,672**	**34**	**27**

NORTH AMERICA
UNITED STATES

KQ2M	**A**	**9,668,020**	**3547**	**1055**
WT6V	**A**	**8,547,549**	**3232**	**969**
		(Op: N6IG)		
NT1N	**A**	**7,535,020**	**2967**	**1004**
NJ1F	*	6,410,495	2845	949
KR1G	*	6,031,480	2619	910
KC1F	*	566,825	596	395
W1EL	*	535,820	550	367
K1UQ	*	300,384	421	288
K5MA	*	128,554	255	199
K5ZD	*	86,240	191	160
AB1R	*	47,328	159	136
WZ1R	**21**	**3,539,448**	**1737**	**792**
		(Op: N1RR)		
KK1H	*	299,098	429	323
AA1BU	**3.7**	**638,577**	**606**	**353**
KE1Y	**3.7**	**629,442**	**641**	**363**
***WA1S**	**A**	**2,440,704**	**1442**	**681**
***WT1S**	**A**	**1,334,272**	**1030**	**512**
***N1FUS**	**A**	**485,080**	**567**	**335**
*N3KCJ	*	423,586	496	314
*W1TO	*	330,292	440	284
*K1HT	*	284,960	380	274
*N1BCL	*	242,545	383	271
*K1YA	*	229,944	407	264
*W1FJ	*	189,614	318	226
*W1TW	*	140,286	276	206
*WA1OFR	*	98,154	231	171
*AB1BX	*	64,635	200	155
*AE1D	*	43,293	140	121
*K1SWG	*	28,764	113	94
***KG1V**	**28**	**30,024**	**120**	**108**
***WE1USA**	**14**	**2,422,176**	**1626**	**736**
		(Op: WA1FCN)		
*AE1B	*	668,680	748	458
*N1DC	*	54,458	164	146
N2ED	**A**	**2,194,908**	**1346**	**634**
KF2O	**A**	**1,926,876**	**1215**	**609**
WR2V	**A**	**380,926**	**434**	**299**
W2UDT	*	302,757	425	273
K2ZB	*	165,312	299	224
W2FUI	*	142,484	286	199
WA2BKN	*	126,144	264	144
W2EZ	*	111,020	262	182
WF2B	*	109,431	244	193
K2YLH	*	109,098	232	174
K2ONP	*	94,350	221	170
***WS1A**	**A**	**1,709,372**	**1111**	**574**
***NA2A**	**A**	**510,081**	**612**	**377**
***NI2P**	**A**	**492,650**	**549**	**334**
*N2CK	*	415,736	533	331
*N2CU	*	360,294	458	309
*K2SZ	*	319,608	405	276
*KA2D	*	282,435	408	285
*KX1X	*	275,842	408	266
*W2RDS	*	273,408	426	267
*W2PI	*	264,537	406	273
*W2MKW	*	239,448	362	264
*W2TZ	*	129,315	246	185
*KB2EOQ	*	108,941	252	197
*W2FGY	*	70,625	163	125
*KG2MV	*	13,735	79	67
*WA2IAU	*	9,860	66	58
*KC2EXL	*	3,060	36	36
***WA2YJF**	**28**	**328,860**	**412**	**324**
***K2BQW**	**21**	**337,006**	**416**	**334**
*KC2Q	*	140,448	231	224
KF3P	**A**	**8,996,976**	**3438**	**1032**
		(Op: K3MM)		
K3ZO	**A**	**6,739,460**	**2728**	**910**
W3BGN	**A**	**4,499,955**	**2122**	**813**
N3HXQ	*	2,482,022	1493	683
4U1WB	*	986,493	1089	493
			(Op: AJ3M)	
W2GPS	*	694,710	715	415
W2BZR/3	*	640,926	718	429
N3FX	*	406,461	487	327
K3GV	*	290,016	429	288
K3MD	*	289,614	391	282
W3BYX	*	243,390	371	266
W3UL	*	234,299	380	269
N3ME	*	206,568	333	228
N3HS	*	195,120	297	240
W3KLG	*	126,024	242	178
WB3EPE	*	99,651	219	177
W3FQE	*	27,144	111	87
N3HBX	**28**	**1,774,440**	**1169**	**620**
***AA3E**	**A**	**3,866,880**	**1996**	**795**
			(Op: W3CF)	
***W3UJ**	**A**	**1,303,542**	**982**	**521**
***N3UN**	**A**	**745,200**	**705**	**414**
*K3DSP	*	635,406	635	411
*WK3I	*	319,156	448	292
*N3FNE	*	225,391	385	263
*N3EYB	*	58,800	170	147
*N3ZPL	*	42,334	151	122
WC4E	**A**	**8,215,398**	**3538**	**1002**
KM9P	**A**	**7,221,522**	**2975**	**957**
			(Op: KL9A)	
WO4O	**A**	**4,067,200**	**2199**	**800**
			(Op: KØEJ)	
K4VUD	*	3,313,676	1878	739
K4BAI	*	1,866,480	1342	616
K4BP	*	1,496,470	1091	569
KN1DX	*	1,420,972	1012	532
			(Op: K4ZW)	
NV4X	*	991,877	814	443
			(Op: K4MA)	
N4MM	*	984,064	798	496
W4YE	*	729,582	655	406
W4SAA	*	709,170	728	385
N4SEA	*	660,832	646	386
AG4W	*	407,130	492	331
W7QF	*	381,645	456	297
NC4MI	*	264,600	397	252
N4YQ	*	254,907	366	243
KE1F	*	147,606	297	219
N4UH	*	57,256	137	136
AF4RK	*	52,204	156	124
W4OGG	*	16,080	100	80
AA3VA	*	972	19	18
NY4A	**28**	**4,387,366**	**2135**	**878**
			(Op: W4ZV)	
N4BP	**28**	**3,008,460**	**1795**	**754**
WZ5V	**28**	**2,249,585**	**1484**	**653**
			(Op: WD4K)	
NC4NC	*	554,880	594	384
NJ2F	*	538,992	578	394
			(Op: WB2WIH)	
KC4UCK	*	324,678	414	318
WW4RR	**21**	**2,720,163**	**1607**	**733**
			(Op: N4ZZ)	
W4NTI	**14**	**26,010**	**113**	**102**
WK4R	**7**	**1,097,848**	**823**	**436**
			(Op: K4XS)	
AA4MM	**1.8**	**58,032**	**276**	**144**
***KU4BP**	**A**	**1,481,276**	**1091**	**547**
***N4IG**	**A**	**1,478,950**	**1037**	**550**
***N4NX**	**A**	**1,342,548**	**935**	**558**
*NY4T	*	1,283,652	1054	543
*K4BEV	*	1,155,096	929	488
*KD4RWN	*	1,144,503	945	513
*NQ4U	*	1,098,192	936	501
*KG4GSY	*	524,755	616	385
*N4YDU	*	416,832	500	334
*KU4FP	*	413,952	497	294
*K1DCB	*	404,880	597	336
*W4ATL	*	379,008	485	329
*WB4IHI	*	315,360	471	292
*WA4VIY	*	290,848	406	298
*K3MZ	*	265,410	396	270
*K8FK	*	257,428	398	278
*KE4UHO	*	208,896	352	256
*NI4ET	*	139,932	282	207
*K4RFK	*	135,432	259	198
*K4AHC	*	103,149	231	157
*W4AMP	*	95,256	221	168
*K8OSF	*	82,110	211	170
*NN4DF	*	65,888	173	142
*KG4ABM	*	46,440	130	120
*KG4CKX	*	15,054	95	78
*WB9BSH	*	12,797	68	67
*KS4JB	*	1,518	23	23
***NT1E**	**28**	**2,695,974**	**1522**	**733**
			(Op: K3BU)	
***K4WI**	**28**	**1,262,352**	**984**	**546**
*WA4JA	*	11,457	88	67
***W4LC**	**21**	**290,766**	**361**	**294**
*NI4S	*	31,694	117	106
*KØCOP/4	*	2,904	35	33
***W4SVO**	**14**	**1,730,283**	**1366**	**673**
*KX2J	*	153,235	423	246
W5WMU	**A**	**4,412,683**	**2479**	**859**
K5RA	**A**	**2,153,224**	**1390**	**632**
KE5OG	**A**	**1,278,536**	**1237**	**553**
N5RXF	*	1,065,746	1293	502
NM5O	*	1,027,520	1087	494
			(Op: N5UM)	
WA5SOG	*	452,193	530	353
N5DD	*	219,840	323	229
KR5DX	*	105,690	255	195
			(Op: K5NZ)	
AC5ZS	*	5,670	50	45
WM5R	**28**	**2,120,202**	**1537**	**639**
KN5H	**28**	**1,329,204**	**1262**	**514**
KE5K	*	391,927	457	349
KI5DR	*	305,228	509	308
NX5M	**21**	**506,800**	**615**	**400**
***KF5YZ**	**A**	**146,744**	**289**	**221**
***NU5DE**	**A**	**92,748**	**203**	**177**
			(Op: N5KF)	
*N7DF	*	87,828	224	156
*WB5QLR	*	19,890	120	90
*KE4W	*	13,724	80	73
*WA2ZOU	*	5,616	60	52
***WJ5DX**	**28**	**1,796,790**	**1407**	**593**
			(Op: W5AJ)	
*KB5EKX	*	87,040	232	170
*KD5FQF	*	4,929	61	53
***NN5Z**	**14**	**205,200**	**438**	**285**
*N1CC	*	34,272	146	126
K6NA	**A**	**6,031,405**	**2799**	**895**
			(Op: N6ED)	
WC6H	**A**	**5,269,056**	**2559**	**832**
			(Op: NU6S)	
AE6Y	**A**	**2,660,000**	**1717**	**700**
AI6V	*	1,478,831	1171	569
			(Op: K6GT)	
W6TE	*	923,667	871	453
W6IXP	*	921,300	883	444
KI6T	*	687,115	710	403
N6OPR	*	584,658	781	401
K7JJ	*	490,870	591	382
N6TW	*	318,478	457	289
WB6NFO	*	243,063	339	239
AA6RX	*	14,630	84	70
WA6DLM	*	2,970	33	33
NE6N	**28**	**3,112,500**	**2038**	**750**
			(Op: N6RT)	
K6JAT	**21**	**227,942**	**344**	**286**
AK6R	**7**	**224,640**	**328**	**234**
***NX6T**	**A**	**1,853,390**	**1399**	**638**
			(Op: K6AM)	
***W3SE**	**A**	**1,390,480**	**827**	**955**
***N6NF**	**A**	**1,256,409**	**1104**	**539**
*WN6K	*	1,204,533	1070	529
*W6QEU	*	980,584	841	484
*WK6I	*	913,125	799	487
*K6UM	*	682,892	674	406
*KG6FFX	*	505,557	623	377
*W6SA	*	343,500	510	300
*K6XX	*	300,516	405	316
*WT6P	*	286,440	422	308
*AD6Z	*	280,782	143	121
*KD6DAE	*	229,245	409	255
*WO6M	*	86,320	200	166
*W6/ EA1BMM	*	81,021	196	157
*K6CSL	*	80,592	198	184
*K6BIR	*	63,992	203	152
*KE6QR	*	58,800	186	140
*W6NS	*	55,042	169	146
*ND6E	*	42,572	134	116
			(Op: K6EP)	
*AA6EE	*	10,934	79	71
*KE6GFI	*	2,400	35	32
*KG6FOD	*	2,380	35	34
*K6LDX	*	24	3	3
***W6AFA**	**28**	**875,811**	**805**	**443**
*KC6AWX	*	447,474	730	321
*W6FFH	*	97,053	215	187
*WX6V	*	49,640	160	136
*N6UB	*	12,141	76	71
***NP4IW/ WT6**	**14**	**194,032**	**411**	**268**
***KU6T**	**7**	**16,184**	**73**	**68**
K7RI	**A**	**5,105,888**	**2624**	**842**
W8AEF	**A**	**1,619,982**	**1256**	**598**
KC7UP	**A**	**565,104**	**568**	**386**
N7LYV	*	473,427	622	369
WD7SL	*	139,320	318	215
WI7F	*	124,028	297	202
WJ7S	**28**	**813,656**	**871**	**404**
W7AYY	*	44,045	133	115
AD7J	**21**	**1,955,253**	**1291**	**659**
			(Op: W7FP)	
WA7LT	**21**	**1,184,040**	**1055**	**552**
KC7V	**14**	**45,080**	**164**	**140**
***WS7V**	**A**	**1,167,572**	**986**	**518**
***N3AIU**	**A**	**966,270**	**935**	**465**
***K7TR**	**A**	**613,824**	**723**	**417**
*W7TSQ	*	508,740	585	366
*W7QN	*	383,460	492	330
*KW7N	*	349,486	488	323
*N7PWZ	*	99,110	282	187
*KG7WZ	*	52,164	185	138
*W7HS	*	47,268	141	117
*W7YVK	*	31,635	111	95
*KC7WUE	*	9,853	65	59
*W7YAQ	*	3,745	37	35
***KB7XL**	**28**	**238,134**	**342**	**258**
***K7OX**	**28**	**64,517**	**186**	**149**
*W7YS	*	21,060	101	90
*K6LMN/7	*	9,211	65	61
*KØUK/M	*	1,305	30	29
***AJ7A**	**3.7**	**90,712**	**279**	**184**
			(Op: W7DD)	
WB8TLI	**A**	**1,834,555**	**1178**	**565**
K2UOP	**A**	**1,122,990**	**897**	**498**
N4ZR	*	162,580	286	220
***KX8R**	**A**	**4,392,350**	**2105**	**821**
			(Op: K8DX)	
***N8CN**	**A**	**1,340,598**	**1020**	**541**
***K5IID**	**A**	**1,204,280**	**953**	**506**
*N8KM	*	1,076,416	898	484
*N8DXR	*	900,949	857	469
*KC8FS	*	604,505	608	379
*N8WK	*	380,052	481	324
*KI8IZ	*	349,366	459	307
*N8BV	*	229,572	397	252
*W8KNO	*	173,264	300	221
*K8CV	*	142,636	273	211
*K8VUS	*	119,890	249	190
*W8IDM	*	85,536	206	176
*K8KHZ	*	50,232	175	138
*K8IKW	*	34,730	130	115
*NJ8J	*	27,398	117	103
*KC8HWV	*	18,492	72	67
WB9Z	**A**	**6,655,456**	**2856**	**964**
K9ZO	**A**	**3,494,172**	**2033**	**771**
			(Op: KB9UWU)	
NA9D	**A**	**3,197,016**	**1895**	**738**
K9MOT	*	2,932,764	1731	722
			(Op: K9PW)	
AI9U	*	2,006,875	1396	625
			(Op: K9JLS)	
N9NS	*	1,047,130	874	490
NF9V	*	356,004	476	319
AA9PB	*	339,300	522	325
K9UQN	*	172,825	287	223
W9GIG	*	22,250	97	89
K9NW	**28**	**2,808,300**	**1558**	**740**
N9HCA	**14**	**1,504,800**	**1336**	**600**
***KS9K**	**A**	**2,022,122**	**1343**	**622**
				(Op: N4TZ)
***KC9FC**	**A**	**522,315**	**562**	**365**
***K9OP**	**A**	**476,960**	**551**	**352**
*K9JE	*	454,298	511	346
*N9KT	*	390,544	504	308
*WT9U	*	282,600	449	300
*KB9KEG	*	260,260	417	260
*K9DDS	*	213,144	410	249
*NG9L	*	200,811	317	271
*AF8C	*	158,670	294	215
*W9LYN	*	108,290	238	170
*K9PG	*	99,000	232	180
*W9JJT	*	35,640	123	110
*W9LYA	*	30,393	120	99
*KI9DX	*	26,857	121	107
*N9KO	*	15,580	94	76
*KB9VSG	*	6,372	58	36
*N9WG	*	4,551	42	41
***K9QVB**	**28**	**271,776**	**383**	**298**
*KD9AC	*	134,844	262	204
*KA9CBJ	*	4	2	2
***NI9C**	**21**	**348,096**	**436**	**336**
***WD9DJD**	**14**	**10,065**	**72**	**61**
*W9JWR	*	2,079	28	27
*W9ILY/M	*	153	9	9
***KX9DX**	**7**	**110,780**	**390**	**191**
NRØX	**A**	**3,274,200**	**1688**	**765**
KØGAS	**A**	**1,334,106**	**1075**	**541**
NØYYO	**A**	**742,510**	**742**	**410**
NØUU	*	545,878	572	382
KCØJQJ	*	241,264	375	272
WØPPF	*	172,420	342	233
WØDET	*	171,402	298	231
KØDAT	*	161,745	276	263
KØJPL	*	101,421	228	177
WA2HFI/Ø	*	34,701	140	129
KKØSS	**28**	**1,637,767**	**1137**	**563**
NAØIA	*	332,576	431	304
WAØOTV	**21**	**2,635**	**37**	**31**
KGØZI	**14**	**1,213,835**	**1461**	**553**
***ACØW**	**A**	**1,865,952**	**1388**	**608**
***KW4T**	**A**	**1,308,075**	**1042**	**535**
***NEØP**	**A**	**340,775**	**468**	**317**
*KIØY	*	267,444	406	276
*NØWY	*	198,858	360	253
*WØBR	*	168,973	343	239
*KCØGPW	*	86,508	227	178
*KAØEIC	*	67,392	198	162
*NØLZ	*	2,117	31	29
***WIØWA**	**1.8**	**28,997**	**217**	**107**
				(Op: WØETC)
*KØCS	*	2,940	53	42

JAMAICA

***6Y4Y**	**A**	**545,700**	**646**	**340**
		(Op: 6Y5/YO3CB)		

BARBADOS

8P6EX	**A**	**1,363,830**	**1048**	**507**
***8P2K**	**A**	**2,686,418**	**1736**	**622**
				(Op: 8P6SH)

CUBA

***CO2II**	**A**	**613,830**	**647**	**395**
***CO2TK**	**28**	**201,978**	**381**	**229**
***CO2PH**	**21**	**233,280**	**446**	**243**

DOMINICAN REPUBLIC

HI8ROX	**28**	**129,307**	**291**	**191**
***HI3LFE**	**A**	**15,834**	**80**	**78**

PANAMA

***3E5ØØBYS**	**28**	**122,170**	**279**	**190**

GUANTANAMO BAY

***KG4MO**	**A**	**1,010,988**	**1149**	**407**
				(Op: K4ZLE)

ALASKA

WL7CMK	**A**	**695,528**	**726**	**383**

US VIRGIN IS.

KP2BH	**A**	**804,440**	**781**	**364**
***NP2DJ**	**A**	**63,431**	**181**	**137**

PUERTO RICO

***WP4LNY**	**A**	**357,348**	**519**	**291**
*WP3GW	*	104,760	246	204
***KP3A**	**28**	**4,473,568**	**2424**	**781**
*WP3A	*	87,480	207	162

GUATEMALA

***TD9PF**	**A**	**920,220**	**974**	**420**
				(Op: TG9AMD)

COSTA RICA

***TI7/N4MO**	**28**	**3,493,952**	**2089**	**704**

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ST. KITTS

V47KP	A	9,631,712	3761	928
		(Op: W2OX)		
V44NK	14	880,614	723	406

CANADA

VE1OP	A	5,262,972	2438	858
VO1WET	A	4,629,440	2171	740
VE7TLL	A	1,330,355	994	485
VE5FX	A	1,075,641	914	483
VE9MY	A	835,417	697	439
VE7XB	*	708,474	703	403
VE7XO	*	362,384	440	284
VE4RP	A	71,121	166	157
VO1MP	28	3,595,823	2043	737
VYØXYL/6	28	863,298	830	438
VE7GL	28	726,510	783	366
VB6A	21	7,925,940	3016	990
		(Op: VE5MX)		
VC3X	21	5,261,694	2230	879
		(Op: VE3CKF)		
VE3ANX	*	4,749,381	2104	819
VYØAA	14	5,238,948	2508	858
		(Op: VA5DX)		
VE6JY	14	2,511,553	1495	671
		(Op: VE7AV)		
VA3TTN	14	864,324	836	453
VE4IM	14	579,111	542	403
VA6MA	3.7	199,752	322	174
		(Op: VE6MAA)		
*VA3UZ	A	7,994,840	2867	980
*VE1JS	A	2,044,406	1183	611
*VE3MQW	*	1,362,822	974	527
*VE6TP	A	1,218,954	948	506
*VE3STT	*	1,088,360	792	460
*VE2AWR	A	1,061,296	883	452
*VE7VR	A	823,251	736	429
*VE4WI	A	611,651	640	383
*VE7FO	*	493,164	550	342
*VE6ZT	*	489,944	502	364
*VE3YQY	*	354,246	444	302
*VA3JNO	*	330,008	449	284
*VE7QO	*	303,318	400	274
*VA2IC	*	240,956	405	236
*VE5MC	A	216,559	763	392
*VA3IX	*	214,790	345	235
*VA3SX	*	210,392	343	238
*VE4MG	*	183,065	325	235
*VE2TPR	*	31,152	165	118
*VE2OWL	*	10,292	68	62
*VE1AOE	28	868,560	878	420
*VE7IN	28	430,660	627	305
*VE1ASJ	*	424,960	574	320
*VE7AVV	*	300,489	413	287
*VE5UF	28	108,295	269	179
*VE2LHP	28	100,620	217	172
*VE7SV	21	4,032,726	1955	794
*VA6RA	21	34,760	158	110
*VE3OIL	7	56,286	119	106
*VY2MGY/3	1.8	44,082	150	79

TURKS AND CAICOS

*VP5E	A	6,111,512	3203	814
		(Op: K6HNZ)		

MEXICO

*XE1KK	A	1,576,614	1274	533
*XE2AUB	A	1,490,861	1261	509
*XE1BEF	28	144,236	277	214

AFRICA

TUNISIA

3V8BB	A	15,689,634	4259	1081
		(Op: YT1AD)		

GHANA

*9G5MD	A	3,534,993	1717	693
		(Op: F5VCR)		

MOROCCO

CN2R	A	20,530,495	5831	1115
		(Op: W7EJ)		

MADEIRA IS.

CT9KY	A	158,885	248	215
*CT3KN	14	569,976	514	374

CANARY IS.

EA8AJO	A	2,049,114	1271	523
EA8AD	*	375,057	479	261
EA8AH	21	12,387,139	3895	1063
EA8LS	*	1,111,056	806	474

CUETA & MELILLA

EA9LZ	7	6,714,062	1613	698
*AM9AR	28	82,761	189	147

REUNION IS.

*FR5FD	A	1,801,735	1156	523

DJIBOUTI

*J28LP	28	1,092,960	791	460

EGYPT

*SU9ZZ	A	9,411,864	3615	847
*SU1HR	A	2,706,341	1594	563
		(Op: RN3OA)		

SOUTH AFRICA

*ZS1JY	A	19,344	84	78
*ZSØE	28	12,852	68	63
		(Op: ZS6AJS)		
*ZS4BS	*	1,850	26	25

ASIA

VIETNAM

3W2KF	A	2,215,218	1460	573
		(Op: F5PBL)		
XV9TH	21	155,720	300	229

ISRAEL

4X6UU	A	41,796	124	108
*4X6DK	A	2,034,120	1304	506
*4Z5JQ	*	728,288	714	352
*4Z5FW	21	51,363	143	117

CYPRUS

5B4KH	28	5,400,687	2709	769

MALDIVES

*8Q7DD	A	95,760	241	180
		(Op: W4WET)		

KUWAIT

9K9X	A	8,724,652	3467	892
		(Op: 9K2HN)		
9K9Z	28	4,771,584	2263	768

WEST MALAYSIA

*9M2TO	A	1,517,370	1281	555

SINGAPORE

9V1YC	A	4,461,738	2349	769

TAIWAN

BV7FF	21	166,616	442	236

CHINA

BA4RF	28	2,990,274	1801	686
*BA4DW	14	197,500	334	250

ARMENIA

EK6CC	3.7	703,290	500	255

KYRGYZSTAN

EX2T	A	3,629,374	2006	653
EX2M	A	3,040,080	1720	636
EX8MDA	*	71,940	183	132
EX8MIO	28	1,120,392	1107	456
*EX7ML	21	202,032	347	244

TAJIKISTAN

EY8MM	A	36,072	130	108
*EZ8CW	A	10,140	67	60
*EZ3A	14	24,332	110	77
		(Op: EZ3AD)		

SOUTH KOREA

HL1CG	28	688,086	668	387
*HL3AHQ	A	203,040	376	235
*HL5UOG	*	156,195	299	195
*HL3GOB	14	68,040	240	120

THAILAND

*HS4BPQ	A	12,580	75	68

JAPAN

JH5FXP	A	10,903,389	3861	987
JA8RWU	A	6,228,854	2638	838
JA6JAP	*	3,238,860	1651	690
JAØQWO	*	2,758,612	1525	652
JM1XCW	*	1,978,464	1242	557
JA2BNN	*	1,941,148	1231	562
JQ1BVI	*	1,726,332	1153	547
JR1UJX	*	1,692,548	1146	538
JR4QZH	*	683,468	641	391
JR1LEV	*	543,078	570	338
JH1OAI	*	285,947	370	269
7J1AOE	*	166,656	318	192
			(Op: K3DI)	
JA3AOP	*	134,250	291	179
JF2FIU	*	89,355	206	161
JA3ORD	*	50,960	148	130
7J1ABD	*	38,792	131	104
JA9CWJ	*	176	8	8
JG3WCZ	*	10	3	2
JR6EZE	28	5,078,745	2207	805
JH7PKU	28	4,842,502	2180	791
JH6AUS	28	3,132,522	1577	706
JG2SON	*	2,660,251	1461	649
JF6OJX	*	1,674,095	1083	565
JL6HKJ	*	213,945	309	255
JN1BMX	*	201,978	320	229
JR3CVO	*	138,504	232	199
JR1LQK	*	97,008	216	172
JH2BTM	*	28,684	106	101
JI3OPA	21	4,516,864	1998	802
JA7BJS	21	2,407,110	1371	618
JA6ZPR	21	2,215,196	1256	634
			(Op: JH6JSR)	
JR4CAU	*	135,234	259	198
JA2CWU	*	51,745	153	131
JH1RFM	7	10,707	45	43
JA1ANA	*	620	11	10
JH4UYB	3.7	2,200	22	22
*7M1MCT	A	2,024,176	1226	583
*JA5EO	A	775,008	715	414
*JA1XRH	A	497,080	544	340
*JA2BQX	*	434,240	525	320
*JA3YPL	*	408,747	522	303
		(Op: JJ3TBB)		
*JM1GHT	*	248,820	357	260
*JG1OWV	*	234,596	364	223
*JA2GHP	*	198,283	329	233
*JA1BMS/1	*	185,148	326	222
*JR1SGU	*	173,888	315	209
*JA1OZK	*	170,136	280	204
*JA1KK	*	167,316	291	219
*JH6FTJ	*	161,595	308	189
*JA2OJ	*	138,006	274	187
*JA3KLI	*	135,360	253	192
*JL3RDC	*	124,257	259	183
*JA9TQY	*	117,847	231	191
*JA1RRA	*	114,264	234	184
*JR1MRG	*	113,025	258	165
*JA6BGA	*	105,357	213	173
*JF2SKV	*	103,180	253	154
*JA1XUY	*	101,574	230	171
*JK1WXM	*	100,488	227	158
*JAØIOF	*	83,776	198	154
*JK2VOC	*	78,218	226	151
*JS1PWV	*	73,830	204	138
*JR3IAL	*	65,610	178	135
*JR2AWS	*	65,610	183	135
*JM1NHZ	*	63,492	177	132
*JH1RMH	*	52,832	142	127
*JA2BEY	*	49,923	143	129
*JHØHON	*	37,900	133	100
*JG3NKP/1	*	27,936	104	97
*JA4BAA	*	26,133	111	93
*JK8WBR	*	23,352	100	84
*JA1VBP	*	19,200	102	80
*JH7CJM	*	16,000	81	80
*JM3XEJ	*	13,039	87	59
*JE1SLP	*	9,204	61	52
*JA6PL	*	6,348	50	46
*JN3PTN	*	2,100	29	28
*JJ1GWF	*	1,380	24	23
*JN3MUC	*	1,340	31	20
*JA6BHW/3	*	1,320	26	22
*JG7AMD	*	799	17	17
*JM3HYL	*	220	120	10
*JF3BFS	28	2,135,610	1243	610
*JH1AZO	28	1,226,820	916	483
*JH7NPF	28	843,336	717	424
*JL1XMN	*	529,720	530	380
*JA1BUI	*	311,664	396	302
*JA6EFT	*	258,944	349	272
*JH1UUT	*	206,912	304	244
*JA5ATN	*	179,100	290	225
*JA6QDU	*	176,330	274	229
*JHØNVX/1	*	160,950	269	222
*JK1SPQ	*	159,216	284	214
*JA3PYC	*	158,236	262	221
*7N2UQC	*	132,600	255	200
*JG4OUU	*	131,124	245	196
*JA7DNO	*	116,383	240	181
*JA1BBA	*	85,536	194	162
*JQ1AHZ/2	*	83,130	192	163
*JG1TVK	*	61,919	166	143
*JA4AQR	*	55,322	140	139
*JA8IJI	*	52,662	153	134
*JP6AAW	*	21,250	94	85
*JA3BBG	*	18,011	89	83
*JJ3OOZ	*	12,529	71	67
*JA1IZ	*	12,276	68	66
*JE3UHV	*	9,338	63	58
*JRØPJR	*	5,031	45	43
*JA2QVP	*	3,045	35	35
*JF1FGY	*	3,040	34	32
*JA3KDJ	*	2,926	77	38
*JE1REU	*	2,088	30	29
*JA1AAT	*	1,875	25	25
*JA7AXP	*	850	18	17
*JH1TUX	*	420	13	12
*JA1EEG	*	12	2	2
*JL3VUL/3	21	1,699,320	1064	595
*JR3RIY	21	1,553,464	1014	556
*JA7NVF	21	1,189,024	876	509
*JR9NVB	*	736,533	639	433
*JA1SWB	*	510,204	528	366
*JGØOXL	*	394,060	452	323
*7K4XNN	*	386,573	473	311
*8J2OOI/2	*	148,104	304	198
		(Op: JR7OMD)		
*JH3LFL/1	*	88,389	207	161
*7K2GMJ	*	33,026	121	98
		(Op: 7K2GMJ)		
*JI7VUR	*	23,184	104	92
*JI4WHS	*	20,418	91	82
*JA7ADV	*	17,082	81	78
*JG5VIA	*	13,124	69	68
*JI8BUR/3	*	7,592	58	52
*JG1GCO	*	2,883	31	31
*JH1KZQ/1	*	2,146	32	29
*JR3KAH	*	1,632	30	24
*JE1TTO	*	646	18	17
*JM4UZM	*	128	16	8
*JHØEPI	14	90,090	208	165
*JL6IPK	7	7,181	47	43
*JE1SPY	3.7	720	18	16

OGASAWARA

*JD1BIA	3.7	11,200	94	50

MONGOLIA

*JU1T	28	229,400	525	248
		(Op: JT1CJ)		

JORDAN

JY9NX	A	15,463,485	4980	1017
		(Op: JM1CAX)		

LEBANON

OD5/ OK1MU	A	8,438,528	3530	896
		(Op: OK1MU)		

TURKEY (ASIA)

*TA3ET	28	282,900	444	230
*TA3BN	21	5,750	47	46
*TA3J	7	2,617,428	994	474

ASIATIC RUSSIA

UA9CDV	A	6,326,563	2601	769
UA9CLB	A	6,309,888	2482	768
RK9CZO	A	5,191,948	2328	766
		(Op: RX9CAZ)		
RZ9SR	*	1,513,748	1062	452
UA9ACJ	*	1,460,412	986	452
RV9BB	*	1,101,576	779	474
UA9XEN	*	1,095,956	804	454
UA9FM	*	604,892	563	388
UA9CKS	*	539,700	566	350
UA9MO	*	517,080	421	372
UA9OS	*	418,932	493	324
RZ9HG	*	225,336	402	246
RA9ST	*	13,760	75	64
UA9LAC	28	794,388	748	386
UA9ZZ	21	3,174,798	1909	726
UA9KJ	21	1,633,536	1048	576
UA9MA	14	4,501,518	1995	798
UA9BS	*	386,712	423	328
UA9MAZ	*	349,128	407	312
RW9TN	*	21,586	91	86
UA9JDP	7	1,999,283	1292	533
RW9HZA	7	1,153,676	672	379
			(Op: RZ9HG)	
RU9AC	3.7	38,922	100	78
*RA9ASA	A	2,627,622	1406	558
*RW9QA	A	2,274,720	1353	560
*RK9KWB	A	1,904,628	1209	564
*RN9RZ	*	1,901,664	1158	568
*RA9DZ	*	824,190	715	415
*RA9FLW	*	599,088	625	336
*UA9TQ	*	553,580	569	356
*RA9OW	*	385,840	465	280
*RZ9IB	*	361,746	495	297
*RU9CI	*	286,275	374	275
*UA9AX	*	205,792	311	218
*UA9ORQ	*	199,602	323	234
*RA9FDR	*	164,907	281	219
*RZ9CX	*	157,850	302	205
*RX9CEL	*	143,662	262	218
*RA9XF	*	141,800	273	200
*RK9AD	*	130,944	264	192
*RX9WN	*	104,760	210	180
*UA9OSV	*	84,854	218	154
*UA9JPK	28	526,820	578	355
*RX9JC	28	496,627	549	349
*RZ9YF	*	429,650	600	325
*UA9JQN	*	274,256	394	281
*RV9AZ	*	222,384	358	246
*UA9OUB	*	131,520	277	192
*UA9OA	*	57,129	181	137
*RJ9J	21	2,138,080	1288	644
			(Op: RA9JR)	
*UA9AAP	*	252,700	357	266
*RA9AU	*	176,833	293	227
*RW9AB	14	1,434,234	844	547
*RV9JR	14	1,300,109	899	527
*RZ9UC	*	634,000	613	400
*RZ9UGN	*	267,054	363	282
*RX9UKF	*	155,001	277	231
UAØANW	A	623,322	650	357
UAØDC	A	203,852	419	226
UAØIV	*	135,138	332	202
RUØAT	*	62,640	173	145
UAØCW	*	4,484	42	38
RSØF	28	1,868,515	1211	583
UAØSR	*	365,501	503	317
*UAØSJ	A	1,536,228	1053	556
*UAØACG	A	753,600	725	400
*UAØQBR	*	315,600	408	300
*UAØWW	*	179,292	313	223
*RAØJJ	*	12,744	83	72
*UAØFDX	21	1,491,976	1174	566
*UAØAPP	*	122,171	246	217
*RZØCQ	*	83,810	191	170

UZBEKISTAN

*UK8IG	14	212,115	335	237

KAZAKHSTAN

UN7OP	A	329,644	408	244
UN4L	28	1,964,061	1363	561
*UP5P	28	1,659,456	1263	576
			(Op: UN5PR)	
*UQ1D	*	810,366	902	393
			(Op: UN7D)	
*UN7RBD	7	34,160	86	80

HONG KONG

VR2BG	28	208,800	290	290

INDIA

*VU3DJQ	14	59,458	174	137

MACAO

*XX9AU	21	737	43	11

UK BASES ON CYPRUS

*ZC4BS	A	3,690,756	2096	653

EUROPE

ITU VIENNA

4U1VIC	A	210,910	378	230

CROATIA

9A3ØY	28	4,083,828	1956	797
		(Op: 9A3LG)		
9A3GW	21	5,177,168	2334	892
9A4X	21	3,859,416	2077	792
9A3MA	*	901,920	853	480
9A5AZZ	3.7	450,822	602	331
9A6A	1.8	453,924	624	324
9A2VR	1.8	232,050	422	255
*9A2YC	A	1,393,864	1004	554
*9A8YL	A	876,469	802	473
*9A3CY	*	63,656	185	146
*9A3ZO	*	32,912	152	121
*9A2RD	28	2,281,530	1409	590
*9A7D	28	1,851,109	1255	533
*9A5V	*	1,265,266	963	478
*9A3B	14	1,701,664	1372	656
			(Op: 9A1AA)	
*9A2L	14	1,273,419	1255	609
			(Op: 9A4GD)	
*9A4RV	14	254,790	533	342

MALTA

9HØA	28	8,166,158	3398	1001

ANDORRA

*C31WP	A	20,370	105	97

PORTUGAL

CT1AHU	28	1,400,125	1199	575
CT1AOZ	14	105,462	298	217
*CT1DSJ	A	274,501	458	313
*CQ5CEC	*	210,663	367	267
*CT1ELF	*	23,940	108	90
*CT1EEN	28	2,679,974	1680	671
*CT2GQN	*	153,584	334	232
*CT1FLD	*	56,620	172	149
*CT1CAD	7	98,600	185	170
*CT2GBK	*	64,575	138	123
*CT1ESO	*	8,050	51	50

GERMANY

DL1IAO	A	7,249,472	3017	908
DJ6QT	A	5,014,800	2383	840
DH1SGS	A	3,445,047	1936	761
DN1LT	*	3,298,614	1915	759
			(Op: DL8UD)	
DL9DYL	*	1,299,520	1010	524
DJ8UV/P	*	1,229,109	1089	547
DL1NEO	*	724,304	773	446
DK5OS	*	516,248	612	376
DH2MA	*	477,264	651	366
DL1PT	*	407,364	560	332
DF7ZS	*	349,048	455	322
DL7JV	*	235,675	406	275
DL6DVU	*	166,110	323	245
DL6UAM	*	157,781	283	229
DL6AG	*	123,264	242	192
DL9GMN	*	66,299	209	167
DL5NA	*	53,975	155	127
DH9KR	*	31,440	152	131
DJ9AO	*	29,312	156	128
DL8WX	*	23,406	122	83
DLØDX	*	23,358	113	102
DJ1AA	28	290,055	407	305
DL7UIO	*	83,328	194	168
DK7AN	*	6,627	49	47
DL4MCF	21	3,553,344	1876	744
DL3BRA	*	134,160	278	215
DJ4PT	7	1,478,932	876	476
*DH9SBL	A	780,066	690	453
*DH8AF	A	665,550	695	425
*DL3ZAI	A	657,342	692	423
*DK6BT	*	614,180	626	410
*DK2DQ	*	605,346	694	406
*DF2SM	*	360,936	489	324
*DH5AO	*	346,112	493	338
*DL2VB	*	333,660	500	332
*DL8SDC	*	280,476	426	294
*DF1ZN	*	217,476	366	252
*DK6AY	*	148,712	345	232
*DL8AAE	*	145,173	303	217
*DL8AKA	*	115,420	272	199
*DL8MUG	*	114,330	242	185
*DL4WA	*	96,192	242	192
*DH5WB	*	90,958	267	178
*DL1ASF	*	70,752	221	176
*DL2MIH	*	59,760	192	166
*DH2PG	*	50,362	182	149
*DL2NBU	*	44,341	166	139
*DL8SDI	*	43,798	154	122
*DJ2UB	*	36,960	148	120
*DL4VAB	*	27,000	144	108

*DL3KDC	*	20,586	108	94
*DL4KUG	*	10,860	67	60
*DL4JTW	*	6,600	58	55
*DL2NOH	*	1,775	25	25
*DL5ANS	*	1,380	23	20
***DL8ULO**	**28**	**37,692**	**131**	**108**
*DLØAZ	*	31,415	117	103
*DJØBX	*	6,768	51	48
*DL7LZ	*	180	15	4
***DL2DBH**	**21**	**1,017,609**	**893**	**489**
***DF7YU**	**14**	**736,971**	**777**	**501**
***DJ2YE**	**7**	**77,425**	**175**	**163**
*DL4VAI	*	19,188	90	82
*DL2RZG	*	7,952	63	56
***DL2SDQ**	**3.7**	**70,370**	**225**	**155**

SPAIN

EA5DFV	**A**	**6,241,927**	**3061**	**883**
AN5DCL	**A**	**1,354,246**	**1151**	**586**
ED1DAX	**A**	**1,334,322**	**1142**	**506**
AN2AP	*	647,223	694	443
ED5ASF	*	573,498	741	422
AN5GU	*	562,474	661	407
EF7AIR	*	443,460	754	389
		(Op: EA7JX)		
EA3ELZ	*	200,406	344	254
EC3ALV	*	61,336	226	164
AN7CA	*	40,959	150	123
AN1CM	*	18,894	108	94
ED3QW	*	12,798	99	81
AM3QP	**28**	**1,428,221**	**1139**	**493**
AM1JJ	**28**	**957,320**	**935**	**455**
EA5DFX	*	284,715	445	285
EA3DUZ	*	212,139	301	243
EA5VR	*	65,527	201	161
EA3IN	**21**	**924,048**	**901**	**496**
AM1JO	**21**	**303,637**	**443**	**337**
EC3DEG	*	48,640	214	152
EF4DJS	*	39,600	213	144
***ED3BOX**	**A**	**2,517,900**	**1533**	**654**
***AN3GEG**	**A**	**2,394,576**	**1455**	**723**
***EA3CI**	**A**	**2,081,013**	**1444**	**627**
*ED1WS	*	1,564,140	1325	597
*AN7RU	*	1,349,660	1164	580
*AN1AJV	*	1,120,422	1148	529
*EA4MD	*	1,000,236	1000	492
*AM5EOR	*	764,855	890	455
*ED3CT	*	660,666	816	447
*EA4ABW	*	605,045	726	413
*AM5QB	*	473,135	645	377
*EA3BCP	*	423,000	559	360
*AN1AUM	*	348,458	597	337
*AN3EFQ	*	337,312	493	332
*EA1IF	*	277,457	498	323
*EA4DAU	*	206,861	395	269
*AN7BDL	*	182,210	404	274
*EA2AOI	*	151,917	292	237
*EA5BTL/6	*	149,730	323	230
*AN4YEL	*	136,896	245	184
*EA3NA	*	129,996	255	207
*EA4EMC	*	115,210	242	205
*AM7EWX	*	100,926	275	189
*EA2BT	*	97,465	269	193
*AN2BNU	*	81,483	207	173
*EA3GHQ	*	75,600	213	168
*EA3FAJ	*	65,081	197	151
*EA4ALJ	*	49,818	160	138
*EA1FBJ	*	37,250	144	125
*EA7OK	*	36,957	140	127
*EA3ARN	*	27,972	167	111
*EA3AAW	*	27,648	130	108
*AN4AAK	*	27,540	122	102
*EA3CZR	*	26,442	139	117
*EA1BAW	*	24,624	111	108
*EA4BSC	*	15,732	85	76
*AO2BAH	*	15,471	86	81
		(Op: EC2BAH)		
*EA5CZL	*	11,628	80	76
*EA7FIQ	*	9,768	68	66
*AN3DTQ/2	*	2,340	40	40
*EA1DFP	*	704	19	16
***AN7FTR**	**28**	**1,760,930**	**1450**	**601**
***AN7AKJ**	**28**	**338,580**	**520**	**342**
*AM3GCJ	*	188,700	324	255
*EA5FST	*	96,570	214	185
*EA7FRX	*	67,624	176	158
*AN3AGB	*	29,046	108	103
*AN5DIT	*	25,186	103	98
*EF7AMD	*	7,865	73	65
		(Op: EC7AMD)		
*AN3FCQ	*	1,342	23	22
*AN5AAJ	*	932	230	166
***AN7HBP**	**21**	**962,580**	**1276**	**526**
***AM7ANM**	**21**	**318,090**	**682**	**345**
***AM7DVE**	**21**	**199,826**	**382**	**293**
*EC2ADR	*	154,375	457	247
*EC5CXI	*	129,082	425	233
*EC4DFA	*	124,597	395	241
*EA3MR	*	104,550	260	205
*AM1CJH	*	70,855	209	185
*EF3CJN	*	61,419	265	177
*EA1BZP	*	56,950	219	170
*EC4DKL	*	51,192	250	162
*EA7HE	*	14,508	112	78
*AN5TN	*	11,952	95	83
*EC7DYC	*	10,230	79	66
***AM3GHZ**	**14**	**30,940**	**120**	**91**
***EA1AUT**	**7**	**46,116**	**158**	**126**
***EA1HP**	**3.7**	**9,638**	**72**	**61**
*EA5AVD	*	1,334	23	23

BALEARIC IS.

AN6AEQ	**A**	**3,553,656**	**2118**	**789**
AM6TC	**A**	**1,370,014**	**1479**	**589**
***EC6PG**	**A**	**124,098**	**338**	**222**
***EA6EA**	**28**	**2,376**	**34**	**33**

IRELAND

EI4DW	**A**	**2,565,136**	**1585**	**619**
***EI2CH**	**A**	**377,883**	**548**	**347**
***EI8GP**	**28**	**1,081,442**	**997**	**382**

MOLDAVIA

ERØND	**A**	**6,762,005**	**2927**	**901**
		(Op: UT7ND)		
ER6A	**A**	**3,157,035**	**2055**	**749**
		(Op: ER1LW)		
ER1BAF	**28**	**14,850**	**80**	**75**
***ER5OK**	**A**	**376,102**	**507**	**346**
***ER1BF**	**A**	**298,072**	**485**	**296**
*ER1CW	*	133,021	297	217
***ER3HW**	**28**	**31,993**	**119**	**107**

ESTONIA

ES2IP	**A**	**4,838**	**45**	**41**
***ES6KW**	**A**	**211,862**	**346**	**259**
***ES4RD**	**A**	**101,493**	**265**	**189**
*ES5AGP	*	15,456	86	84
*ES4GY	*	7,308	64	58
***ES6CO**	**28**	**49,536**	**145**	**128**
*ES4BG	*	31,185	125	105
*ES5RGJ	*	18,532	90	82
*ES1AC	*	11,256	76	67
*ES6EA	*	3,927	48	33
***ES6MT**	**21**	**104,342**	**236**	**203**
*ES5CX	*	6,615	107	35

BELARUS

EU1PA	**A**	**1,091,616**	**1091**	**498**
EU1SA	**A**	**1,001,952**	**1069**	**497**
EU2DX	*	706,860	815	420
EW1WZ	**14**	**1,196,624**	**1124**	**572**
EW6AL	**7**	**103,425**	**219**	**175**
***EW1ABF**	**28**	**26,036**	**125**	**92**
***EW1GA**	**21**	**104,715**	**263**	**195**
*EU6TT	*	24,411	121	103
***EU1AZ**	**3.7**	**334,125**	**529**	**275**
***EU6DX**	**1.8**	**5,824**	**56**	**52**

FRANCE

F1TE	**A**	**7,596,208**	**3155**	**976**
F5RZJ	**A**	**3,805,665**	**1989**	**795**
F5BBD	**A**	**1,025,114**	**950**	**503**
F2AR	*	618,233	700	407
F/ON4AUC	**28**	**652,740**	**734**	**330**
F5JY	*	542,250	552	375
***F6KZC**	**A**	**836,432**	**833**	**488**
***F8AAN**	**A**	**429,318**	**584**	**366**
*F5POJ	*	302,870	449	310
*F6FTB	*	268,650	401	270
*F5PCX	*	82,824	232	174
*F5JBF	*	17,848	118	92
***F5AJG**	**28**	**179,545**	**297**	**241**
***F5ASD**	**14**	**45,314**	**212**	**163**

ENGLAND

G3UFY	**A**	**146,704**	**275**	**212**
G3UEG	**A**	**118,950**	**320**	**183**
GX4WSM	**21**	**2,664,186**	**1594**	**687**
***G2TO**	**A**	**1,699,800**	**1181**	**600**
		(Op: GØKRL)		
***MØBRK**	**A**	**1,308,951**	**1060**	**553**
*G4NXG/M	*	217,679	368	257
*G4PIQ	*	201,128	373	248
*G4DDX	*	49,915	170	149
***G3YOG**	**28**	**18,450**	**88**	**82**
***M4T**	**14**	**30,915**	**161**	**135**
		(Op: GØVQR)		
***G4VGO**	**1.8**	**49,950**	**184**	**135**

SCOTLAND

GM7V	**A**	**4,903,138**	**2263**	**838**
		(Op: GM4YXI)		
GM3BCL	**A**	**846,906**	**773**	**437**
***MMØBQI**	**A**	**38,025**	**134**	**117**

GUERNSEY

***MUØFAL**	**A**	**274,215**	**493**	**303**

WALES

GW3NJW	**A**	**444,185**	**501**	**343**
***GW7X**	**A**	**6,225,688**	**2718**	**856**
		(Op: GW4BLE)		
*MW5EPA	*	32,595	154	123
***GWØAJI**	**21**	**89,232**	**261**	**208**

HUNGARY

HA8JV	**A**	**4,880,343**	**2389**	**867**
HA6NL	**A**	**1,569,990**	**1169**	**590**
HA3FT	**28**	**223,000**	**351**	**250**
HA5WE	**14**	**618,273**	**721**	**459**
***HA8LIF**	**28**	**282,150**	**372**	**275**
*HA8QB	*	174,336	303	227
***HG3DX**	**21**	**1,081,350**	**951**	**486**
		(Op: HA3UU)		
*HA4YO	*	68,040	205	162

SWITZERLAND

HB9CIC	**A**	**983,505**	**899**	**519**
HB9CQS	*	60,996	174	138
HB9NN	**28**	**12,172**	**73**	**68**
***HB9IQY**	**A**	**495,817**	**620**	**367**

ITALY

IU4T	**A**	**4,795,440**	**2298**	**795**
IZ4COW	**A**	**1,754,920**	**1248**	**601**
IR8J	*	534,765	679	385
IK3OII	*	56,146	163	134
IK3XTY	*	230	11	10
IU2P	**28**	**2,598,420**	**1552**	**635**
		(Op: I2PJA)		
IQ3X	**28**	**2,036,445**	**1263**	**635**
IO4T	**28**	**1,203,788**	**918**	**514**
		(Op: IK4VET)		
IZ5ASZ	*	255,760	338	278
I3YYY	*	3	1	1
IK8UND	**21**	**569,360**	**686**	**440**
II3L	**7**	**117,688**	**297**	**188**
		(Op: IV3KAS)		
I4AVG	**3.7**	**876,024**	**852**	**414**
IQ3A	**1.8**	**355,770**	**575**	**295**
		(Op: IV3TAN)		
***IR4B**	**A**	**1,221,500**	**976**	**500**
		(Op: IK4AUY)		
***IZ6CST**	**A**	**616,488**	**699**	**408**
***IZØBVU**	**A**	**506,178**	**680**	**366**
*IK2THN	*	283,635	412	297
*IK2BKA	*	228,238	353	278
*IK2WZQ	*	163,300	287	230
*IZ2ACG	*	110,544	251	188
*IQ8S	*	108,834	287	194
*IK8IFW	*	103,179	257	211
*IK6ZDE	*	101,462	255	194
*IZ2ABN	*	86,064	196	163
*IR2D	*	73,892	215	182
*IK2YSJ	*	38,500	153	125
*IK2WYI	*	33,660	126	110
*IK2WFN	*	24,297	107	91
*IV3KSE	*	15,840	86	80
*IK3SCB	*	1,426	26	23
***IR1A**	**28**	**1,427,920**	**1034**	**520**
		(Op: IK1GPG)		
***IO7C**	**28**	**383,308**	**467**	**316**
		(Op: I7PXV)		
*IZ4DYP	*	149,313	259	213
*IK4QJM	*	139,740	263	204
*IZ5BSA	*	16,800	108	100
***IØKHP**	**1.8**	**1,300**	**27**	**26**

SICILY

IR9A	**A**	**2,163,975**	**1704**	**671**
IT9JOF	**28**	**258,332**	**372**	**262**
IU9S	**14**	**3,794,624**	**2258**	**844**
		(Op: IT9BLB)		
IT9STX	**14**	**2,305,080**	**1764**	**684**
***IT9VCE**	**A**	**792,200**	**993**	**466**
***IT9ESW**	**A**	**341,034**	**523**	**339**
*IT9AJP	*	252,576	401	288
***IT9ICS**	**14**	**871,200**	**1026**	**495**

NORWAY

LA9DFA	**A**	**1,472**	**24**	**23**
LA6EIA	**3.7**	**252,960**	**440**	**255**
LA6WEA	**1.8**	**62,064**	**200**	**144**
***LA3BO**	**A**	**1,209,060**	**1037**	**540**
***LA8OM**	**A**	**602,784**	**761**	**416**
*LA1PHA	*	213,945	376	255
*LB8AE	*	146,640	358	240
*LA2HFA	*	99,134	260	194
*LA4CKA	*	69,488	199	172
*LA6BBA	*	33,990	121	110
*LA8GK	*	20,493	111	99
***LA5JX**	**28**	**35,451**	**135**	**117**
*LA5YV	*	672	20	14
***LA8WG**	**21**	**58,301**	**205**	**173**
*LA3HM	*	2,242	43	38

LUXEMBOURG

LX4A	**28**	**808,556**	**828**	**469**
		(Op: LX1NO)		
***LX1JH**	**A**	**546,084**	**603**	**394**
*LX1ER	*	459,921	593	363

LITHUANIA

LY2IJ	**A**	**2,983,992**	**1795**	**762**
LY2CY	**A**	**2,757,640**	**1696**	**710**
LY6M	*	282,133	460	307
		(Op: LY1DS)		
LY2KM	*	105,592	250	197
LY2BET	*	17,876	99	82
LY2OU	**28**	**494,514**	**604**	**331**
LY2OX	**21**	**999,186**	**877**	**482**
LY3BH	**21**	**808,860**	**740**	**442**
LY2BM	**1.8**	**151,107**	**346**	**209**
***LY2DX**	**A**	**1,018,215**	**1061**	**495**
***LY3CY**	**A**	**431,719**	**606**	**353**
*LY2TA	*	126,893	304	227
*LY2FN	*	107,055	271	195
*LY3IT	*	99,330	309	210
*LY1DI	*	80,070	248	170
*LY2TZ	*	64,960	244	160
*LY2MM	*	27,636	106	94
*LY4AB	*	2,325	31	31
***LY2DM**	**28**	**232,716**	**372**	**246**
*LY2LA	*	119,944	264	188
***LY3CW**	**21**	**59,906**	**1832**	**154**

BULGARIA

LZ9W	**A**	**1,622,619**	**1003**	**513**
		(Op: LZ1ZD)		
LZ1QZ	*	15,392	97	74
LZ8T	**3.7**	**705,320**	**766**	**385**
		(Op: LZ2CJ)		
***LZ1DM**	**A**	**259,440**	**320**	**282**
***LZ9R**	**A**	**164,112**	**348**	**263**
		(Op: LZ3YY)		
*LZ2MP	*	107,010	245	174
*LZ2FDI	*	24,624	124	108
***LZ2GS**	**28**	**220,409**	**334**	**259**
***LZ5UU**	**1.8**	**24,700**	**120**	**95**
*LZ1UQ	*	20,880	111	90
*LZ2UZ	*	2,475	36	33

AUSTRIA

OE7SQ	**A**	**5,561,335**	**2650**	**871**
OE75CWL	**A**	**1,697,358**	**1181**	**611**
		(Op: OE5CWL)		
OE5OHO	*	599,940	631	396
OE75WWL	**21**	**22,413**	**99**	**93**

FINLAND

OH2U	**A**	**7,367,643**	**3195**	**953**
		(Op: OH2LUR)		
OH5LF	**A**	**5,211,591**	**2464**	**879**
OH6RX	**A**	**4,749,648**	**2446**	**848**
OH6NIO	*	3,296,743	1824	787
OG3M	*	2,378,103	1500	651
		(Op: OH1VR)		
OH5NE	*	1,348,702	1260	571
OH3JR	*	446,918	493	361
OH3LQK	*	18,225	109	81
OH9MM	**28**	**855,184**	**784**	**452**
OH6NJ	*	445,872	555	336
OH3RF	*	86,190	206	195
OH3UU/6Y5	**21**	**348,984**	**484**	**262**
OH1EB	*	57,750	177	154
OH3BU	**3.7**	**148,780**	**311**	**215**
***OH2LYP**	**A**	**715,260**	**837**	**455**
***OH2ME**	**A**	**300,748**	**464**	**322**
*OH2FS	*	118,464	227	192
*OH2GBI	*	31,510	152	115
			(Op: NG8T)	
*OH1BOI	28	189	9	9
***OH2MDC**	**21**	**9,384**	**76**	**68**

CZECH REPUBLIC

OK1RI	**A**	**10,844,592**	**3787**	**1034**
OK1EP	**A**	**2,498,720**	**1611**	**679**
OK2FD	**A**	**2,004,253**	**1163**	**703**
OK1KT	*	730,227	664	437
OK2RZ	**28**	**2,452,032**	**1460**	**688**
		(Op: OK1FUA)		
OK2PVF	**28**	**1,050,619**	**863**	**461**
OK1FCJ	**21**	**2,076,900**	**1309**	**644**
OK1GK	**14**	**902,751**	**971**	**527**
OK1XC	*	65,096	176	158
OK2EQ	**7**	**81,337**	**219**	**163**
OK1TP	**1.8**	**101,936**	**263**	**184**
***OK1DCF**	**A**	**1,139,468**	**1004**	**517**
***OK2MBP**	**A**	**832,105**	**845**	**461**
***OK2BMT**	**A**	**507,600**	**582**	**376**
*OK2INW	*	478,201	582	367
*OK2CMW	*	476,840	563	364
*OK2EC	*	437,162	591	341
*OK2ZJ	*	436,800	520	350
*OK1DDO	*	429,450	592	350
*OK1VBA	*	424,840	533	344
*OK8ACS	*	377,060	490	340
*OK1AOV	*	291,710	401	310
*OK1JN	*	223,006	442	238
*OK1FMX	*	163,325	340	235
*OK1AOU	*	132,252	289	214
*OK1FKV	*	88,433	248	191
*OK1DKO	*	82,739	213	157
*OK2TBC	*	78,402	227	179
*OK1HGM	*	60,344	172	152
*OK2PBG	*	55,282	160	131
*OK1FCA	*	34,920	135	120
*OK2SWL	*	25,088	121	112
*OK2SWD	*	19,788	110	97
*OK2BDF	*	17,864	86	77
***OK1KDT**	**28**	**268,185**	**369**	**285**
*OK1SI	*	91,530	199	162
*OK2BHE	*	5,250	45	42
***OK2NN**	**21**	**428,610**	**515**	**390**
*OK1DKA	*	135,880	266	215
*OK2PCN	*	62,118	184	153
*OK1MMN	*	59,432	177	152
*OK1MFG	*	38,100	160	127
***OK2CQR**	**14**	**178,980**	**358**	**285**
*OK1CAZ	*	6,208	70	64
***OK2PPM**	**7**	**63,504**	**175**	**147**
*OK1TGI	*	53,958	167	138
***OK1FPS**	**3.7**	**354,000**	**569**	**295**
***OK2ZV**	**3.7**	**290,920**	**510**	**280**
*OK2CLW	*	82,170	241	166
*OK2ZIL	*	71,840	227	160
***OK2SNX**	**1.8**	**99,372**	**290**	**182**

SLOVAKIA

OM2DX	**28**	**3,072,877**	**1699**	**691**
OM5DX	**28**	**2,184,320**	**1343**	**640**
OM5M	**7**	**1,596,928**	**1152**	**512**
***OM6T**	**A**	**2,151,435**	**1470**	**663**
		(Op: OM5AW)		
***OM7AG**	**A**	**870,048**	**961**	**456**
***OM4DN**	**A**	**551,968**	**709**	**376**
*OM3PQ	*	544,440	617	390
*OM3YK	*	339,528	481	301
*OM4TX	*	336,294	468	314
*OM2AWX	*	194,360	408	226
*OMØCW	*	115,540	314	212
*OM5KM	*	114,534	241	202
*OM3CDZ	*	114,072	300	196
*OM3TA	*	66,667	198	163
*OM3EA	*	55,300	185	156
*OM8HG	*	54,426	175	141
***OM4KK**	**28**	**222,976**	**351**	**256**
*OM7YC	*	90,180	200	167
*OM9TR	*	36,076	125	106
***OM6RM**	**14**	**38,100**	**200**	**150**

BELGIUM

OT1T	**A**	**9,130,968**	**3262**	**972**
		(Op: RA3AUU)		
***ON4XG**	**A**	**392,620**	**519**	**335**
*ON5JD	*	80,613	225	169
*ON4CJN	*	43,008	176	128
*ON4KVA	*	6,048	60	56
***OT1H**	**21**	**919,392**	**822**	**488**
		(Op: ON4CLN)		
***ON7SS**	**14**	**40,610**	**200**	**155**

DENMARK

OZ5EV	**A**	**951,846**	**764**	**519**
OZ3SK	**1.8**	**168,520**	**382**	**220**
***OZ1ACB**	**A**	**564,792**	**646**	**404**
*OZ1GDI	*	24,990	125	102
***OZ1JVX**	**14**	**53,578**	**225**	**178**

THE NETHERLANDS

PAØLSK	**A**	**28,896**	**140**	**112**
PAØIJM	**28**	**247,698**	**395**	**278**
***PAØJNH**	**A**	**272,309**	**409**	**307**
***PA8MO**	**A**	**190,160**	**481**	**310**
*PA3AAV	*	101,380	225	185
*PAØKDM	*	14,450	100	85
***PAØMIR**	**28**	**313,100**	**386**	**310**
***PAØCYW**	**21**	**245,864**	**366**	**292**

SLOVENIA

S5ØA	**A**	**7,545,864**	**3033**	**876**
		(Op: S57AW)		
S51TA	**A**	**5,310,375**	**2458**	**833**
S57DX	**A**	**5,091,156**	**2411**	**801**
S56A	*	1,998,976	1364	644
S54W	**21**	**2,239,092**	**1394**	**666**
		(Op: S59A)		
S56M	*	992,404	892	469
S51CK	**14**	**1,423,328**	**1163**	**608**
S52O	**7**	**2,102,544**	**1201**	**558**
		(Op: S52RU)		
S59CAB	**3.7**	**1,064,700**	**960**	**450**
		(Op: S53MM)		
S58M	**3.7**	**468,882**	**617**	**342**
S52CW	*	348,900	545	300
***S53EA**	**A**	**3,606,975**	**1948**	**765**
***S52LW**	**A**	**1,685,749**	**1210**	**611**
***S57MSU**	**A**	**708,995**	**721**	**431**
*S57NRO	*	581,600	656	400
*S57UYX	*	454,194	517	351
*S54X	*	365,310	456	369
*S57NPR	*	107,226	255	207
*S57IIO	*	14,773	93	79
***S52OT**	**28**	**891,315**	**753**	**435**
*S57NMQ	28	492,156	510	378
***S5ØL**	**21**	**298,893**	**447**	**331**
***S53F**	**3.7**	**385,789**	**561**	**317**
***S54A**	**1.8**	**17,056**	**103**	**82**

SWEDEN

SMØW	**A**	**1,200,540**	**1021**	**535**
		(Op: SMØWKA)		
SM6WOB	**A**	**1,089,414**	**994**	**522**
8S4Z	*	401,310	550	343
		(Op: SM4SET)		
SM7BJW	*	372,360	504	321
7S2E	**28**	**1,142,196**	**938**	**509**
		(Op: SM2DMU)		
8S7A	*	412,757	511	331
		(Op: SM7CRW)		
SK6TY	**14**	**13,500**	**114**	**90**
		(Op: SM6FUD)		
SM1HPV	*	1,840	58	22
SM6FUD	**7**	**325,167**	**453**	**283**
***SM7VGI**	**A**	**234,568**	**407**	**269**
***SMØBDS**	**A**	**179,892**	**316**	**263**
*SM3W	*	172,040	359	230
		(Op: SM3WMV)		
*SM6DER	*	153,840	349	240
*7SØZ	*	144,585	322	243
		(Op: SMØNZZ)		
*7S3A	*	67,257	175	141
		(Op: SM3CER)		
*SM7FTG	*	64,998	198	157
*SM7TKR	*	63,990	189	162
*SM4AIO	*	50,836	168	142
*SM6XKB	*	45,016	171	136
*8SØW	*	7,406	57	46
		(Op: SMØNJO)		
***SK4UW**	**28**	**31,993**	**126**	**107**
		(Op: SM4JHK)		
*SM7DXQ	*	10,206	64	63
***SM2ODB**	**21**	**193,480**	**337**	**280**
*SM3D	*	117,820	298	215
*SM5DYC	*	68,960	187	160
***SM5NBE**	**14**	**335,250**	**586**	**375**
*SM3T	*	5,607	70	63
		(Op: SM3RUJ)		

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*SM7HSP	*	3,744	52	48
***SM4HEJ**	**1.8**	**240**	**16**	**15**

POLAND

SP6IXF	**A**	**2,768,610**	**1668**	**687**
SP3KFH	**A**	**1,259,925**	**991**	**535**
		(Op: SP3JZR)		
SN4T	**A**	**943,340**	**922**	**505**
SP5ATO	*	442,745	524	365
SP3NUN	*	344,964	492	323
SP3HUU	*	216,412	355	262
SP7GIQ	**28**	**2,294,901**	**1433**	**657**
SP7FDV	*	141,643	261	197
SQ9AOR	*	46,846	145	118
SP3GEM	**21**	**4,680,888**	**2226**	**804**
SP5GRM	**21**	**3,452,938**	**1860**	**697**
SP2AVE	*	12,778	78	73
SP2BLC	*	12,139	91	61
SN8V	**14**	**3,069,080**	**1918**	**791**
		(Op: SP8GQU)		
SP9QMP	**14**	**1,114,648**	**1040**	**554**
SP2QVU	*	23,520	124	112
SQ4NR	3.7	64	4	4
***SP4DEU**	**A**	**500,250**	**632**	**375**
***SP4XQN**	**A**	**472,622**	**646**	**383**
***SP9HQC**	**A**	**378,325**	**505**	**325**
*SP7A	*	300,048	464	304
		(Op: SP7FQI)		
*SP8OON	*	232,416	434	269
*SP5BB	*	227,460	336	255
*SP2AYC	*	215,364	372	274
*SP1DMD	*	209,076	349	262
*SP4AAZ	*	208,440	375	270
*SP5ICS	*	205,010	377	247
*SQ4CUX	*	140,598	309	219
*SP9PRO	*	111,652	252	206
*SP6PCM	*	108,064	237	176
*SP9KJU	*	96,161	224	169
*SP6TRO	*	89,473	261	131
*SQ4HRN	*	71,073	215	159
*SP4CQU	*	56,658	162	133
*SP3XR	*	54,180	149	126
*SP3MGP	*	50,435	162	131
*SP1MVG	*	47,872	160	128
*SP6GNJ	*	44,144	144	124
*SP9XUE	*	42,418	149	127
*SP4AVG	*	38,430	154	122
*SP6FJ	*	13,400	70	67
*SP6NVK	*	8,525	56	55
*SP6EWB/9	*	5,723	65	59
*SP9HZF	*	5,289	47	41
*SP6OPE	*	4,625	44	37
*SQ9OXN	*	4,264	50	41
*SP2GCE	*	3,366	36	34
*SP6BEN	*	1,292	19	19
*SP6DVP	*	598	16	13
***SQ9HYM**	**28**	**281,374**	**382**	**269**
***SP3GTS**	**28**	**68,110**	**172**	**139**
*SP3KTS	*	65,075	167	137
*SP8UZJ	*	63,342	173	138
*SP4DC	*	31,824	108	102
*SQ9ZM	*	28,800	116	90
*SP5XSL	*	24,487	200	47
*SP8DYY	*	2,730	31	30
***SP9XCN**	**21**	**623,380**	**642**	**439**
***SN2X**	**21**	**585,178**	**630**	**397**
		(Op: SP2DWG)		
*SP8OOB	*	16,600	100	83
***SP9EWO**	**14**	**234,132**	**410**	**327**
***SP3GHK**	**14**	**130,095**	**320**	**245**
*SP4SHD	*	101,700	298	225
*SP1JON	*	20,304	120	108
***SP6YIT**	**1.8**	**2,046**	**33**	**31**

GREECE

SV/OK1YM	**A**	**474,075**	**798**	**387**
SV1DKR	**A**	**339,678**	**562**	**339**
SV2AEL	**28**	**35,947**	**139**	**103**
***SV1DZB**	**A**	**338,661**	**541**	**333**
***SV2EVA**	**28**	**53,332**	**156**	**134**
***SV1DKL**	**21**	**615,624**	**994**	**452**
***SV2BBD**	**14**	**10,701**	**99**	**87**

BOSNIA AND HERZEGOVINA

***T94DO**	**14**	**639,431**	**1003**	**487**
***T90U**	**3.7**	**407,640**	**598**	**316**
		(Op: T95MOJ)		
***T9/S57CQ**	**3.7**	**383,320**	**612**	**296**
*T98R	*	188,020	366	238

EUROPEAN RUSSIA

RQ4L	**A**	**6,216,730**	**3093**	**970**
		(Op: UA4LCQ)		
RK4FF	**A**	**3,943,263**	**2338**	**821**
RA3AJ	**A**	**3,728,760**	**2213**	**805**
UA4HTT	*	2,713,472	1772	731
RD4M	*	2,241,246	1886	714
		(Op: UA4LU)		
RW1ZA	*	1,538,242	1263	593
UA4ASE	*	931,590	1033	495
RZ4AN	*	901,967	898	491
RU3DX	*	836,384	888	472
RZ3RC	*	490,266	693	378
RV1CC	*	421,245	557	333
RK4CN	*	405,375	559	345
RW4AA	*	314,817	509	303
UA3DK	*	218,784	339	318
RN3RQ	*	152,570	296	209
RA3MB	*	111,612	250	213
RA3NN	*	107,282	297	194
RA3VR	*	54,166	191	146
UA1AFZ	*	25,482	108	93
RA4AG	*	17,510	100	85
UA1AKE	*	9,168	54	48
UA4WNH	*	8,316	72	66
RA6AR	*	6,050	58	55
RV3ACA	**28**	**584,459**	**675**	**361**
RU6MM	**28**	**436,760**	**546**	**358**
RU4HU	*	98,262	259	206
UA3RSO	*	70,307	201	167
RI3A	**21**	**3,372,950**	**1968**	**805**
		(Op: RK3FT)		
RX6LG	**21**	**1,900,272**	**1556**	**671**
UA3DPX	**21**	**1,269,342**	**1015**	**582**
UA4CCC	*	254,772	452	337
RA3XO	*	35,595	117	105
RM3C	**14**	**1,425,280**	**1171**	**640**
		(Op: RA3CW)		
RU6FA	**14**	**1,292,000**	**1207**	**608**
RA6LBS	**14**	**1,104,037**	**1101**	**601**
RK4WWA	*	1,045,152	1085	573
		(Op: UA4WA)		
RV4CT	*	909,540	1002	558
UA6LAK	*	320,802	570	381
RZ3DZZ	*	42,968	150	131
RZ1AK	**3.7**	**366,048**	**508**	**328**
RA3VV	**3.7**	**61,292**	**203**	**154**
RK6BZ	*	60,298	183	146
RA4FW	*	53,535	167	129
***UA4FER**	**A**	**2,582,270**	**1853**	**710**
***RU3QW**	**A**	**2,502,420**	**1824**	**716**
***UA3ABJ**	**A**	**1,129,471**	**1032**	**509**
*RZ4FA	*	993,434	846	494
*RA1AR	*	877,012	1004	466
*RA3DNC	*	802,452	905	492
*UF3CWR	*	491,883	791	397
		(Op: RZ3AZ)		
*RV3LO	*	491,176	657	392
*RV3UK/3	*	411,255	598	333
*UA3LHL	*	406,690	553	335
*RW3VZ	*	397,531	558	331
*UA4RF	*	392,504	521	344
*RN3FT	*	374,760	553	360
*UA3BZ	*	358,700	530	340
*UA1CKC	*	330,645	493	329
*UA6LV	*	322,588	417	287
*RU4PU	*	287,100	485	290
*UA6JD	*	284,258	494	338
*U1BA	*	275,054	494	298
*UA6UDV	*	253,616	492	262
*RV3QX	*	196,272	370	261
*UA3XBB	*	196,245	390	267
*UA1TBK	*	194,560	405	256
*RU4LM	*	150,556	325	266
*RX3RZ	*	142,987	345	221
*RW3AFY	*	108,942	246	201
*RU4WE	*	105,444	307	202
*UA4LDP	*	101,985	265	195
*RA3MS	*	90,200	283	200
*RA3AF	*	72,852	186	156
*UA1ANX	*	36,570	143	115
*RW6CW	*	27,454	133	106
*RX3AEX	*	14,652	85	74
*RV3IC	*	11,868	99	86
***R73A**	**28**	**1,076,416**	**1082**	**484**
		(Op: RZ3AA)		
***RA3OU**	**28**	**301,903**	**429**	**301**
*UA4LBQ	*	152,154	300	237
*RA1AW	*	116,280	270	190
*UA6NZ	*	67,032	179	152
*UA3RAW	*	23,200	102	100
*RU3DVR	21	240,464	435	304
*RW3PN	*	19,012	110	97
***UA3XEV**	**14**	**161,491**	**409**	**277**
*RN1AO	*	12,420	120	90
*RZ3DJZ	*	11,700	100	90
***RZ3DO**	**3.7**	**15,540**	**139**	**70**
***RK6AIQ**	**1.8**	**1,680**	**32**	**30**

KALININGRADSK

UA2FF	**28**	**1,559,160**	**1199**	**568**
UA2FB	**7**	**2,227,795**	**1276**	**565**
RK2FWA	**3.7**	**60,248**	**186**	**136**
		(Op: RN2FA)		
***RA2FBC**	**A**	**259,896**	**376**	**273**
*RA2FA	*	1,440	26	24

UKRAINE

UV7D	**A**	**4,129,064**	**2189**	**824**
		(Op: UT7DX)		
UY4F	**A**	**2,564,856**	**1747**	**727**
		(Op: UR5FEL)		
UY4I	**A**	**2,404,732**	**1885**	**682**
		(Op: US3IZ)		
UT2IW	*	1,201,431	1003	539
UR6MX	*	1,130,424	1061	536
UX5UO	*	735,264	694	432
EM1KCC	*	316,909	488	311
US1MM	*	214,121	391	277
UX7MM	*	151,084	286	214
UT4MW	*	121,184	277	224
UT5JCE	*	30,250	135	110
UT9FJ	*	5,461	49	43
UR7EO	*	126	6	6
UV5U	**28**	**167,166**	**301**	**222**
		(Op: UX1UA)		
UR6MW	**21**	**149,048**	**379**	**248**
EO3Q	**14**	**2,544,060**	**1824**	**778**
		(Op: UR3QCW)		
UX3MR	**14**	**940,692**	**1054**	**554**
UX6F	*	290,580	591	348
		(Op: US-F-027)		
UR6IJ	*	267,112	438	346
UT8IM	*	51,516	180	159
UR6QA	**1.8**	**185,719**	**385**	**229**
UR5ETN	*	19,135	104	89
US5ISV	*	18,509	102	83
***UZ5U**	**A**	**1,300,208**	**1040**	**532**
***UW5U**	**A**	**1,073,312**	**1042**	**544**
		(Op: UY2UA)		
*UT8IT	*	148,274	347	238
*UT4PZ	*	63,917	199	161
*UX4UA	*	60,048	168	139
*UR4EI	*	51,101	169	137
*UU5JSP	*	47,840	171	130
*UT4EO	*	32,017	116	101
*UR7EM	*	8,850	70	59
***UR7M**	**28**	**671,987**	**728**	**409**
		(Op: UT5MB)		
***UR8QR**	**21**	**381,850**	**621**	**350**
***USØHZ**	**7**	**196,272**	**339**	**232**
***UR3HC**	**3.7**	**289,640**	**485**	**260**
*UT4TA	*	88,605	233	179

LATVIA

YL2KO	**A**	**3,581,460**	**1942**	**788**
YL2LY	**28**	**88,009**	**211**	**167**
YL6W	**21**	**3,225,196**	**1750**	**734**
		(Op: YL2GD)		
***YL2GN**	**A**	**872,808**	**909**	**492**
***YL2TW**	**A**	**859,275**	**954**	**475**
*YL2MF	*	7,884	60	54
***YL3BZ**	**28**	**72,772**	**200**	**161**

ROMANIA

YO4NF	**14**	**1,837,360**	**1610**	**680**
YO3FF	*	1,298	22	22
YO2BEH	**1.8**	**19,923**	**111**	**87**
YO4CIS	*	1,792	30	28
***YO5OEF**	**A**	**537,972**	**625**	**381**
***YO6BHN**	**A**	**411,320**	**540**	**364**
*YO3NL	*	303,276	413	381
*YO5OHO	*	50,479	166	143
*YO8MI	*	48,564	150	142
*YO2DFA	*	35,712	123	93
*YO6QT	*	6,206	61	58
***YO8DDP**	**28**	**283,864**	**398**	**274**
*YO8DHD	*	27,645	109	97
*YO2LGX	*	12,096	70	63
***YO4GAO**	**21**	**1,752,598**	**1443**	**646**
*YO4BBH	*	58,164	200	148
***YO4BXX**	**14**	**76,612**	**262**	**214**
*YO6ADW	*	44,536	200	152
*YO4US	*	16,568	82	76

YUGOSLAVIA

YT7R	**A**	**3,355,080**	**1903**	**766**
		(Op: YU7BW)		
4N8/LZ1BJ	*	352,314	608	333
YT6A	**28**	**3,317,600**	**1764**	**715**
4O1W	**28**	**2,633,370**	**1569**	**610**
		(Op: YZ1AU)		
4O7F	**28**	**2,081,526**	**1334**	**589**
		(Op: YT7KF)		
4O7A	**21**	**4,222,492**	**2210**	**794**
		(Op: YU7AV)		
4O1B	**14**	**4,702,538**	**2552**	**893**
		(Op: YT1BB)		
YZ9A	**14**	**2,543,372**	**1662**	**767**
		(Op: YU7NU)		
4O7M	**7**	**1,947,699**	**1185**	**537**
		(Op: YU7GMN)		
YU7AZL	*	13,425	79	75
YTØT	**3.7**	**633,556**	**742**	**374**
		(Op: YU1EA)		
4N1KW	**3.7**	**497,080**	**682**	**344**
YT6T	*	252,434	436	266
***4O7B**	**A**	**3,375,567**	**1980**	**767**
***YU7QL**	**A**	**1,714,581**	**1309**	**621**
*YZ1EW	*	172,752	358	244
*YU7RN	*	83,248	230	176
*YU1PJ	*	7,548	64	51
*YU7HI	*	7,392	60	56
***YUØA**	**28**	**2,708,524**	**1560**	**637**
		(Op: YU1DX)		
***YU7WW**	**28**	**959,728**	**798**	**451**
*YZ1V	*	553,131	569	369
*YU7SF	*	75,348	183	156
*YU7YZ	*	66,430	171	146
***4N1N**	**21**	**559,994**	**765**	**422**
*YU1BX	*	2,291	29	29
***YU7KM**	**14**	**33,564**	**162**	**142**
***4N1A**	**1.8**	**123,000**	**308**	**200**
		(Op: YT1DX)		
*YU1AST	*	13,275	88	75
		(Op: YT1CA)		

MACEDONIA

Z35M	**7**	**14,850**	**84**	**75**
***Z31GX**	**A**	**1,536**	**25**	**24**
***Z35G**	**14**	**192,474**	**433**	**306**

OCEANIA

EAST MALAYSIA

9M6A	**21**	**5,052,699**	**2373**	**729**
		(Op: G4MJS)		

THE PHILIPPINES

DU1UGZ	**A**	**1,186,559**	**993**	**401**
DU1SAN	*	218,768	337	226
DU1IVT	**28**	**1,039,869**	**905**	**387**
***DU1LER**	**A**	**113,568**	**244**	**168**
***4F4IX**	**28**	**1,153,690**	**913**	**430**
***DX1E**	**28**	**671,968**	**688**	**332**
		(Op: 4F1EJD)		
***DU1DX**	**21**	**86,229**	**217**	**143**

MARIANA IS.

***KHØ/ JM1LRQ**	**A**	**6,685,416**	**3084**	**724**
***WHØV**	**28**	**1,149,888**	**914**	**424**

GUAM

***AH7X/NH2**	**A**	**6,577,208**	**2996**	**682**
		(Op: JP1NWZ)		

HAWAII

KH6ND	**A**	**15,498,798**	**4528**	**1029**
KH6TO	**A**	**7,965,180**	**3060**	**855**
AH6OZ	**3.7**	**411,450**	**362**	**195**
*KH6GMP	A	503,400	570	300

MARSHALL IS.

V73UX	**A**	**651,897**	**613**	**339**

AUSTRALIA

VK5GN	**A**	**3,382,590**	**1629**	**705**
VK8AV	**A**	**66,555**	**159**	**145**
VK2CZ	**28**	**796,430**	**735**	**365**
VK4CEJ	**28**	**308,310**	**411**	**258**
VK1JDX	**14**	**72,352**	**172**	**152**
***VK2CA**	**A**	**1,506,344**	**1007**	**518**
***VK4DZ**	**28**	**631,152**	**674**	**324**
*VK4EJ	*	68,768	218	122
***VK6JIP**	**14**	**6,909**	**49**	**49**

INDONESIA

YBØL8K	**A**	**3,214,410**	**1665**	**654**
YBØA	**A**	**2,997,315**	**1553**	**645**
***YCØWWW**	**21**	**35,343**	**123**	**99**
*YC2VVD	*	14,784	97	84

NEW ZEALAND

ZL1ANJ	**A**	**3,372,015**	**1583**	**705**
***ZL1TM**	**A**	**2,184,138**	**1262**	**594**
***ZL3GA**	**28**	**108,927**	**223**	**171**

SOUTH AMERICA

GUYANA

8R1K	**A**	**12,657,035**	**4085**	**977**
		(Op: OHØXX/EA4BQ)		

CHILE

CC4A	**A**	**6,900,250**	**2758**	**875**
CE4Y	**28**	**3,636,424**	**1836**	**682**
3G4P	**28**	**3,288,780**	**1729**	**660**
		(Op: CE4PBB)		
*CE4MLN	A	2	2	1

BOLIVIA

CP1FF	**A**	**176,137**	**303**	**221**

URUGUAY

CW6V	**A**	**6,875,565**	**2691**	**885**
		(Op: CX6VM)		
CX7ACH	**28**	**1,739,925**	**1101**	**555**
CW8C	**7**	**253,933**	**256**	**197**
		(Op: CX8CP)		
***CX9AU**	**A**	**253,215**	**368**	**255**
***CX1ACV**	**28**	**1,918,227**	**1155**	**579**
***CX8BAE**	**28**	**1,322,937**	**961**	**483**

FRENCH GUIANA

FY5FY	**14**	**5,518,910**	**2198**	**853**

GALAPAGOS IS.

HC8A	**A**	**25,180,199**	**6537**	**1199**
		(Op: N6KT)		

COLOMBIA

HK6PSG	**A**	**5,632,700**	**2230**	**790**

ARGENTINA

LO7H	**A**	**4,433,285**	**2002**	**769**
LU1BR	**A**	**3,459,608**	**1688**	**712**
LP1F	**28**	**7,785,953**	**2875**	**931**
		(Op: LU5FC)		
LU2FA	**28**	**7,728,915**	**2939**	**893**
LW7DX	**28**	**4,287,920**	**1938**	**760**
LU7YW	*	1,012,554	784	459
LU4DJC	*	58,362	150	137
LU4IC	**14**	**504,538**	**514**	**347**
L2ØF	**7**	**437,248**	**333**	**256**
		(Op: LU9FDG)		
***LRØN**	**A**	**3,804,600**	**1796**	**746**
		(Op: LU2NI)		
***LU1YY**	**A**	**1,106,173**	**756**	**527**
***LU1FF**	**A**	**968,457**	**805**	**431**
*LU5ER	*	817,236	698	423
*LU5EVK	*	562,438	571	361
*LU5JKG	*	321,160	419	280
*LU1ARV	*	14,775	79	75
***LU3HIP**	**28**	**4,342,140**	**1950**	**765**
***LU4DX**	**28**	**3,365,152**	**1614**	**724**
***LTØH**	**28**	**2,938,806**	**1542**	**661**
		(Op: LU3HY)		
*L4ØE	*	2,237,280	1318	590
		(Op: LW7EIC)		
*LU9HNQ	*	1,730,751	1127	537
*LT5H	*	1,299,708	992	457
		(Op: LU2HF)		
*LU1DFO	*	1,235,924	878	502
*AY5E	*	1,009,654	764	467
		(Op: LU5DV)		
*L44D	*	618,410	604	355
*LU2EC	*	548,628	558	349
*LW7EGO	*	506,025	549	325
*LW2DX	*	469,216	504	344
*LW1HDJ	*	465,696	488	336
*LU9JX	*	64,207	165	143
*LU9HGF	*	136	9	8
***LU4DRC**	**21**	**624,960**	**594**	**372**
		(Op: LW1DTZ)		
*LU2HRH	*	4,620	44	42

PERU

***OA4EI**	**A**	**1,647,243**	**1115**	**513**

ARUBA

P4ØV	**A**	**18,699,401**	**5293**	**1121**
		(Op: AI6V)		
P41E	**A**	**6,950,336**	**2694**	**829**
		(Op: P43E)		
P49MR	**21**	**3,491,560**	**1765**	**684**
		(Op: VE3MR)		
***P4ØA**	**A**	**12,547,872**	**4287**	**927**
		(Op: KK9A)		

NETHERLANDS ANTILLES

PJ2WI	**A**	**8,987,348**	**3505**	**866**
		(Op: WI9WI)		

BRAZIL

PY2YU	**A**	**5,974,290**	**2366**	**870**
PT7BZ	**A**	**5,476,733**	**2182**	**787**
PY4VB	**A**	**3,319,821**	**1705**	**657**
PY2GA	*	1,144,100	938	425
PV2M	*	360,295	446	299
PT2CMN	*	67,050	183	150
PY7BEL	*	35,409	147	111
PS8NF	*	8,736	58	52
PY2KQ	**28**	**2,148,545**	**1261**	**595**
PU7ENW	*	1,836	30	27
PY2OZF	**21**	**134,250**	**272**	**179**
PY6KY	**7**	**10,384**	**47**	**44**
***ZX2B**	**A**	**6,712,550**	**2564**	**898**
		(Op: PY2MNL)		
***PY2NDX**	**A**	**819,420**	**692**	**420**
*PT2GE	*	268,752	405	264
*PY7IQ	*	208,392	304	228
*PP7ZZ	*	172,494	274	222
*PY2MPG	*	44,144	155	124
*PY1AFS	*	14,630	96	77
*PR7AR	*	6,550	51	50
*PY1WAG	*	5,964	53	42
*PY5FB	*	1,530	31	30
***PP5JD**	**28**	**7,599,774**	**2889**	**898**
***ZX5X**	**28**	**1,926,663**	**1189**	**557**
***PU2MXU**	**28**	**585,603**	**593**	**369**
*PY5HSD	*	514,602	532	339
*PU2PGR	*	244,684	410	268
*ZY2W	*	129,560	274	205
		(Op: PT2ND)		
*PY5JO	*	127,917	241	183
*PY1SX	*	101,010	199	182
*PR7FN	*	83,106	208	171
*PY5DC	*	82,967	197	163
*PY2DJH	*	25,047	117	99
*PY2DBU	*	22,019	101	97
*PY2TST	*	9,796	68	62
***PY2NW**	**21**	**683,757**	**645**	**369**
***PT2AW**	**21**	**253,750**	**357**	**250**
*PY2AER	*	16,728	84	68
***PR7QI**	**14**	**492,576**	**500**	**336**
*PP2RON	*	40,946	131	118
*PT2BW	*	5,324	47	44
***PV8DX**	**7**	**162,333**	**195**	**153**
*PY2SAA	*	5,811	41	39

VENEZUELA

4M5E	**21**	**1,811,171**	**1097**	**563**
		(Op: YV5NWG)		
***YW3B**	**A**	**410,112**	**427**	**288**
***YV2FEQ**	**28**	**327,846**	**457**	**303**
*YV6BXN	*	117,294	251	173

PARAGUAY

*ZP5/YO7BA	21	176	10	8

TRIBANDER/ SINGLE ELEMENT

UNITED STATES

NT1N	**A**	**7,535,020**	**2967**	**1004**
NA9D	**A**	**3,197,016**	**1895**	**738**
K9MOT	*	2,932,764	1731	722
		(Op: K9PW)		
N2ED	**A**	**2,194,908**	**1346**	**634**
AI9U	*	2,006,875	1396	625
		(Op: K9JLS)		
K4BAI	**A**	**1,866,480**	**1342**	**616**
WB8TLI	**A**	**1,834,555**	**1178**	**565**
KE5OG	**A**	**1,278,536**	**1237**	**553**
NM5O	*	1,027,520	1087	494
		(Op: N5UM)		

4U1WB	**A**	**986,493**	**1089**	**493**	**DU1UGZ**	**A**	**1,186,559**	**993**	**401**	***IT9AJP**	**A**	**252,576**	**401**	**288**	***SQ4HRN**	**A**	**71,073**	**215**	**159**	*N5ZC	*	527	19	17
		(Op: AJ3M)			PY2GA	*	1,144,100	938	425	*DF1ZN	*	217,476	366	252	***LA4CKA**	**A**	**69,488**	**199**	**172**	***WZ7ZR**	**21**	**1,216,584**	**1045**	**554**
NØYYO	**A**	**742,510**	**742**	**410**	**HB9CIC**	**A**	**983,505**	**899**	**519**	***VE5MC**	**A**	**216,559**	**763**	**392**	***W6NS**	**A**	**55,042**	**169**	**146**				(Op: W7ZR)	
W4YE	*	729,582	655	406	OK1KT	*	730,227	664	437	*SP2AYC	*	215,364	372	274	*K8KHZ	*	50,232	175	138	***K1SE**	**21**	**40,086**	**146**	**131**
W4SAA	*	709,170	728	385	VE7XB	*	708,474	703	403	*LA1PHA	*	213,945	376	255	***SM6XKB**	**A**	**45,016**	**171**	**136**	***K9GY**	**28**	**20,706**	**97**	**87**
W2GPS	*	694,710	715	415	**AN2AP**	**A**	**647,223**	**694**	**443**	***ES6KW**	**A**	**211,862**	**346**	**259**	***ON4CJN**	**A**	**43,008**	**176**	**128**					
N6OPR	**A**	**584,658**	**781**	**401**	ED5ASF	*	573,498	741	422	*PY7IQ	*	208,392	304	228	***MMØBQI**	**A**	**38,025**	**134**	**117**			DX		
N7LYV	**A**	**473,427**	**622**	**369**	JR1LEV	*	543,078	570	338	*SP5ICS	*	205,010	377	247	***MW5EPA**	**A**	**32,595**	**154**	**123**	**OE4A**	**A**	**5,958,738**	**2593**	**918**
N3FX	*	406,461	487	327	RZ3RC	*	490,266	693	378	***VE4MG**	**A**	**183,065**	**325**	**235**	*EA3ARN	*	27,972	167	111	**SO8ZZ**	**A**	**5,043,676**	**2470**	**869**
NF9V	*	356,004	476	319	**GW3NJW**	**A**	**444,185**	**501**	**343**	*AN7BDL	*	182,210	404	274	***KB9VSG**	**A**	**6,372**	**58**	**36**				(Op: UY5ZZ)	
K1UQ	*	300,384	421	288	RK4CN	*	405,375	559	345	***SM3W**	**A**	**172,040**	**359**	**230**	*KC2EXL	*	3,060	36	36	**UZ7U**	**A**	**4,057,773**	**2156**	**831**
NC4MI	*	264,600	397	252	JH1OAI	*	285,947	370	269				(Op: SM3WMV)		*KG6FOD	*	2,380	35	34				(Op: UT3UA)	
WB6NFO	*	243,063	339	239	LY6M	*	282,133	460	307	*JH6FTJ	*	161,595	308	189	***JN3PTN**	**A**	**2,100**	**29**	**28**	**DF6QV**	**A**	**3,386,194**	**1822**	**763**
N5DD	*	219,840	323	229				(Op: LY1DS)		*DL8AAE	*	145,173	303	217	***HA8LIF**	**28**	**282,150**	**372**	**275**	**OI5AX**	**A**	**3,013,794**	**1858**	**714**
K9UQN	*	172,825	287	223	**DL7JV**	**A**	**235,675**	**406**	**275**	*JA2OJ	*	138,006	274	187	***UA9JQN**	**28**	**274,256**	**394**	**281**				(Op: OH2JTE)	
WØPPF	*	172,420	342	233	**4U1VIC**	**A**	**210,910**	**378**	**230**	*AN4YEL	*	136,896	245	184	***AM3GCJ**	**28**	**188,700**	**324**	**255**	**RA3WA**	**A**	**2,343,132**	**1654**	**671**
KØDAT	*	161,745	276	263	**G3UFY**	**A**	**146,704**	**275**	**212**	*JA3KLI	*	135,360	253	192	***ZY2W**	**28**	**129,560**	**274**	**205**	**YBØAVK**	**A**	**2,117,115**	**1238**	**585**
WA2BKN	*	126,144	264	144	UT4MW	*	121,184	277	224	*RK9AD	*	130,944	264	192	***SQ9ZM**	**28**	**28,800**	**116**	**90**	OH3OJ	*	2,026,563	1614	651
W3KLG	*	126,024	242	178	HA6NL	*	99,864	222	171	*JR1MRG	*	113,025	258	165	*PY2DJH	*	25,047	117	99	**OK2ZW**	**A**	**1,921,689**	**1283**	**649**
AB1R	*	47,328	159	136	HB9CQS	*	60,996	174	138	*SP9PRO	*	111,652	252	206	***KD5FQF**	**28**	**4,929**	**61**	**53**	**JA2ZJW**	**A**	**1,811,719**	**1130**	**559**
WA2HFI/Ø	*	34,701	140	129	IK3OII	*	56,146	163	134	*IQ8S	*	108,834	287	194	*PU2PGR	*	244,684	410	268				(Op: JH2CMI)	
WA6DLM	*	2,970	33	33	JA3ORD	*	50,960	148	130	*SP6PCM	*	108,064	237	176						**LY5W**	**A**	**1,539,850**	**1189**	**575**
KN5H	**28**	**1,329,204**	**1262**	**514**	DLØDX	*	23,358	113	102	*JA6BGA	*	105,357	213	173	***4N1N**	**21**	**559,994**	**765**	**422**				(Op: LY1DR)	
NJ2F	**28**	**538,992**	**578**	**394**	ED3QW	*	12,798	99	81	*EA2BT	*	97,465	269	193	***CT3KN**	**14**	**569,976**	**514**	**374**	**IZ5CML**	**A**	**1,405,010**	**988**	**545**
		(Op: WB2WIH)			UA1AKE	*	9,168	54	48	*SP6TRO	*	89,473	261	131	***OK2CQR**	**14**	**178,980**	**358**	**285**	**HAØHW**	**A**	**1,388,044**	**1025**	**557**
KGØZI	**14**	**1,213,835**	**1461**	**553**	JG3WCZ	*	10	3	2	*ON5JD	*	80,613	225	169	***M4T**	**14**	**30,915**	**161**	**135**	**OM3IAG**	**A**	**1,173,754**	**1072**	**509**
***NX6T**	**A**	**1,853,390**	**1399**	**638**	**OH6NJ**	**28**	**445,872**	**555**	**336**	*JK2VOC	*	78,218	226	151				(Op: GØVQR)		**VE9FX**	**A**	**1,165,056**	**857**	**492**
		(Op: K6AM)			**HB9NN**	**28**	**12,172**	**73**	**68**	*7S3A	*	67,257	175	141	***OK2CLW**	**3.7**	**82,170**	**241**	**166**	**AM5YJ**	**A**	**866,136**	**997**	**453**
***W3SE**	**A**	**1,390,480**	**827**	**955**	**9M6A**	**21**	**5,052,699**	**2373**	**729**				(Op: SM3CER)		*OK2ZIL	*	71,840	227	160	OK1AXB	*	819,486	759	477
***WT1S**	**A**	**1,334,272**	**1030**	**512**				(Op: G4MJS)		***OM3TA**	**A**	**66,667**	**198**	**163**						**LA6MV**	**A**	**750,848**	**824**	**448**
***KW4T**	**A**	**1,308,075**	**1042**	**535**	**LY2OX**	**21**	**999,186**	**877**	**482**	*9A3CY	*	63,656	185	146						**VE3ZZ**	**A**	**622,336**	**648**	**374**
*W3UJ	*	1,303,542	982	521	**OE75WWL**	**21**	**22,413**	**99**	**93**	*SP3MGP	*	50,435	162	131						DJ9MH	*	614,673	677	419
*WN6K	*	1,204,533	1070	529				(Op: OE5WWL)		*PY2MPG	*	44,144	155	124						DL7AOS	*	515,819	644	379
***WS7V**	**A**	**1,167,572**	**986**	**518**	**RA6LBS**	**14**	**1,104,037**	**1101**	**601**	*ON4CJN	*	43,008	176	128						EA3EJI	*	404,434	523	367
*K4BEV	*	1,155,096	929	488	**VE4IM**	**14**	**579,111**	**542**	**403**	***MMØBQI**	**A**	**38,025**	**134**	**117**						UT5UGR	*	371,346	640	354
*KD4RWN	*	1,144,503	945	513	**VK1JDX**	**14**	**72,352**	**172**	**152**	*EA1FBJ	*	37,250	144	125						LY1FW	*	340,028	494	338
*NQ4U	*	1,098,192	936	501	**OH3BU**	**3.7**	**148,780**	**311**	**215**	*EA7OK	*	36,957	140	127						EF5AMK	*	240,035	591	305
***N8KM**	**A**	**1,076,416**	**898**	**484**	***P4ØA**	**A**	**12,547,872**	**4287**	**927**	*9A3ZO	*	32,912	152	121						EA5FID	*	139,416	283	222
*N8DXR	*	900,949	857	469				(Op: KK9A)		*OH2GBI	*	31,510	152	115						**UAØAGI**	**A**	**122,140**	**233**	**197**
*K6UM	*	682,892	674	406	***SU9ZZ**	**A**	**9,411,864**	**3615**	**847**				(Op: NG8T)							AM5BM	*	99,902	290	209
*KC8FS	*	604,505	608	379	***ZX2B**	**A**	**6,712,550**	**2564**	**898**	*VE2TPR	*	31,152	165	118						**RN2FA**	**A**	**29,998**	**127**	**106**
*KG4GSY	*	524,755	616	385				(Op: PY2MNL)		*JG3NKP/1	*	27,936	104	97						IK7WUE	*	21,984	115	96
***NI2P**	**A**	**492,650**	**549**	**334**	***KHØ/**					*EA3CZR	*	26,442	139	117						OE1TKW	*	17,633	84	77
***K9JE**	**A**	**454,298**	**511**	**346**	**JM1LRQ**	**A**	**6,685,416**	**3084**	**724**	***OZ1GDI**	**A**	**24,990**	**125**	**102**						OE75W	*	3,570	36	35
*N4YDU	*	416,832	500	334	***AH7X/NH2**	**A**	**6,577,208**	**2996**	**682**	*EA1BAW	*	24,624	111	108									(Op: OE1TKW)	
*N2CK	*	415,736	533	331				(Op: JP1NWZ)		***CT1ELF**	**A**	**23,940**	**108**	**90**						**S5ØC**	**28**	**3,354,024**	**1752**	**732**
*K1DCB	*	404,880	597	336	***LRØN**	**A**	**3,804,600**	**1796**	**746**	***C31WP**	**A**	**20,370**	**105**	**97**									(Op: S53CC)	
*W7QN	*	383,460	492	330				(Op: LU2NI)		*JH7CJM	*	16,000	81	80						**UUØA**	**28**	**2,184,483**	**1421**	**633**
*W4ATL	*	379,008	485	329	***9G5MD**	**A**	**3,534,993**	**1717**	**693**	*EA4BSC	*	15,732	85	76									(Op: UUØJX)	
*N2CU	*	360,294	458	309				(Op: F5VCR)		*SP6FJ	*	13,400	70	67						**HA6NF**	**28**	**1,824,075**	**1165**	**603**
*KW7N	*	349,486	488	323	*SU1HR	*	2,706,341	1594	563	*EA5CZL	*	11,628	80	76						**LY2IC**	**28**	**16,640**	**90**	**80**
*KI8IZ	*	349,366	459	307				(Op: RN3OA)		*DL4KUG	*	10,860	67	60						**IR8A**	**21**	**3,481,720**	**1926**	**820**
***NEØP**	**A**	**340,775**	**468**	**317**	***8P2K**	**A**	**2,686,418**	**1736**	**622**	*ES4GY	*	7,308	64	58									(Op: I8QLS)	
*WT9U	*	282,600	449	300				(Op: 8P6SH)		***YO6QT**	**A**	**6,206**	**61**	**58**						**4O1Z**	**21**	**1,264,839**	**1145**	**529**
*KA2D	*	282,435	408	285	***ED3BOX**	**A**	**2,517,900**	**1533**	**654**	*AN3DTQ/2	*	2,340	40	40									(Op: YT1RX)	
*AD6Z	*	280,782	143	121	*AN3GEG	*	2,394,576	1455	723	***IO7C**	**28**	**383,308**	**467**	**316**						**RK6CZ**	**21**	**1,065,572**	**1102**	**542**
*KIØY	*	267,444	406	276	***ZL1TM**	**A**	**2,184,138**	**1262**	**594**				(Op: I7PXV)							**JQ1NGT**	**21**	**769,972**	**708**	**428**
*K8FK	*	257,428	396	278	***VE1JS**	**A**	**2,044,406**	**1183**	**611**	***PAØMIR**	**28**	**313,100**	**386**	**310**						**VE7NNN**	**14**	**4,668,625**	**2090**	**845**
*KD6DAE	*	229,245	409	255	***7M1MCT**	**A**	**2,024,176**	**1226**	**583**	***UA9JQN**	**28**	**274,256**	**394**	**281**						**9A7R**	**14**	**3,386,251**	**1835**	**803**
*W8KNO	*	173,264	300	221	***YU7QL**	**A**	**1,714,581**	**1309**	**621**	***JU1T**	**28**	**229,400**	**525**	**248**						**LX7I**	**14**	**2,261,246**	**1609**	**754**
*WØBR	*	168,973	343	239	***G2TO**	**A**	**1,699,800**	**1181**	**600**				(Op: JT1CJ)							**4O1J**	**14**	**2,210,222**	**1725**	**658**
***KF5YZ**	**A**	**146,744**	**289**	**221**				(Op: GØKRL)		***AM3GCJ**	**28**	**188,700**	**324**	**255**									(Op: YU1JW)	
*NI4ET	*	139,932	282	207	***OA4EI**	**A**	**1,647,243**	**1115**	**513**	***F5AJG**	**28**	**179,545**	**297**	**241**						**IN3NJB**	**14**	**516,272**	**592**	**328**
*W2TZ	*	129,315	246	185	***UAØSJ**	**A**	**1,536,228**	**1053**	**556**	***JA6ODU**	**28**	**176,330**	**274**	**229**						**UT7MD**	**14**	**59,858**	**196**	**173**
*KB2EOQ	*	108,941	252	197	***VK2CA**	**A**	**1,506,344**	**1007**	**518**	*EA5FST	*	96,570	214	185						**AM3ALV**	**7**	**82,164**	**201**	**167**
*K9PG	*	99,000	232	180	***VE3MQW**	**A**	**1,362,822**	**974**	**527**	*EA7FRX	*	67,624	176	158						**PY5BF**	**7**	**4,256**	**33**	**32**
*W2FGY	*	70,625	163	125	*MØBRK	*	1,308,951	1060	553	*JA4AQR	*	55,322	140	139						**UT7L**	**3.7**	**818,571**	**782**	**417**
*KG7WZ	*	52,164	185	138	***UA3ABJ**	**A**	**1,129,471**	**1032**	**509**	***ES6CO**	**28**	**49,536**	**145**	**128**									(Op: UXØLL)	
*W7HS	*	47,268	141	117	*AN1AJV	*	1,120,422	1148	529	***G3YOG**	**28**	**18,450**	**88**	**82**						***RW3DU**	**A**	**1,100,580**	**1004**	**510**
*KG4ABM	*	46,440	130	120	*VE3STT	*	1,088,360	792	460	***JA7NVF**	**21**	**1,189,024**	**876**	**509**						***VE3HG**	**A**	**884,843**	**716**	**431**
*W9JJT	*	35,640	123	110	***KG4MO**	**A**	**1,010,988**	**1149**	**407**	*JR9NVB	*	736,533	639	433						***PAØKHS**	**A**	**720,613**	**726**	**437**
*K8IKW	*	34,730	130	115				(Op: K4ZLE)		***SN2X**	**21**	**585,178**	**630**	**397**						***7L4IOU**	**A**	**662,068**	**633**	**367**
*W7YVK	*	31,635	111	95	*EA4MD	*	1,000,236	1000	492				(Op: SP2DWG)							***VE9WH**	**A**	**596,684**	**589**	**382**
*W9LYA	*	30,393	120	99	*LU1FF	*	968,457	805	431	***PT2AW**	**21**	**253,750**	**357**	**250**						***EA3AQM**	**A**	**537,435**	**611**	**405**
*KI9DX	*	26,857	121	107	*RA1AR	*	877,012	1004	466	***EC4DKL**	**21**	**51,192**	**250**	**162**						*AM3FF	*	496,133	621	407
*KE4W	*	13,724	80	73	***9A8YL**	**A**	**876,469**	**802**	**473**	***VA6RA**	**21**	**34,760**	**158**	**110**						***SQ8FEW**	**A**	**332,150**	**505**	**325**
*N9WG	*	4,551	42	41	***YL2TW**	**A**	**859,275**	**954**	**475**	***TA3BN**	**21**	**5,750**	**47**	**46**						***9A4KA**	**A**	**226,728**	**413**	**282**
*KE6GFI	*	2,400	35	32	***F6KZC**	**A**	**836,432**	**833**	**488**	***VU3DJQ**	**14**	**59,458**	**174**	**137**						***DH1NFL**	**A**	**165,432**	**354**	**244**
***N1DC**	**14**	**54,458**	**164**	**146**	*PY2NDX	*	819,420	692	420	***PP2RON**	**14**	**40,946**	**131**	**118**						***PY2TO**	**A**	**163,530**	**274**	**207**
***WD9DJD**	**14**	**10,065**	**72**	**61**	*AM5EOR	*	764,855	890	455	***ON7SS**	**14**	**40,610**	**200**	**155**						***DK3GI**	**A**	**144,904**	**249**	**236**
					***DH8AF**	**A**	**665,550**	**695**	**425**											*EA1GL	*	132,930	247	210
		DX			*DL3ZAI	*	657,342	692	423											***ON4CAS**	**A**	**118,059**	**252**	**177**
JY9NX	**A**	**15,463,485**	**4980**	**1017**	***CO2II**	**A**	**613,830**	**647**	**395**			ROOKIE								***EI7GL**	**A**	**79,674**	**213**	**147**
		(Op: JM1CAX)			*EA4ABW	*	605,045	726	413	**K9ZO**	**A**	**3,494,172**	**2033**	**771**						*VA3NR	*	76,220	177	148
PJ2WI	**A**	**8,987,348**	**3505**	**866**	***LA8OM**	**A**	**602,784**	**761**	**416**				(Op: KB9UWU)							***OM7PY**	**A**	**36,410**	**124**	**110**
		(Op: WI9WI)			*LU5EVK	*	562,438	571	361	**SM6WQB**	**A**	**1,089,414**	**994**	**522**						***DJ6TK**	**28**	**125,649**	**252**	**207**
CW6V	**A**	**6,875,565**	**2691**	**885**	***KH6GMP**	**A**	**503,400**	**570**	**300**	**EU2DX**	**A**	**706,860**	**815**	**420**						***JG2REJ**	**28**	**59,265**	**155**	**135**
S51TA	**A**	**5,310,375**	**2458**	**833**	***SP4DEU**	**A**	**500,250**	**632**	**375**	**N6OPR**	**A**	**584,658**	**781**	**401**						***EA1BHQ**	**28**	**40,560**	**130**	**120**
VE1OP	**A**	**5,262,972**	**2438**	**858**	*JA1XRH	*	497,080	544	340	**RZ3RC**	**A**	**490,266**	**693**	**378**						***ZV2V**	**21**	**1,394,582**	**974**	**497**
HA8JV	**A**	**4,880,343**	**2389**	**867**	***VE7FO**	**A**	**493,164**	**550**	**342**	**N4YQ**	**A**	**254,907**	**366**	**243**									(Op: PY2LED)	
IU4T	**A**	**4,795,440**	**2298**	**795**	***VE6ZT**	**A**	**489,944**	**502**	**364**	**WØDET**	**A**	**171,402**	**298**	**231**						***ON4APU**	**21**	**552,976**	**580**	**428**
VO1WET	**A**	**4,629,440**	**2171**	**740**	***OK1VBA**	**A**	**424,840**	**533**	**344**	**DJ9AO**	**A**	**29,312**	**156**	**128**						***IC8JAH**	**3.7**	**226,931**	**395**	**257**
RA3AJ	**A**	**3,728,760**	**2213**	**805**	*EA3BCP	*	423,000	559	360	**UA3RSO**	**28**	**70,307**	**201**	**167**						***YU1RA**	**1.8**	**4,888**	**52**	**47**
AN6AEQ	**A**	**3,553,656**	**2118**	**789**	***YW3B**	**A**	**410,112**	**427**	**288**	**ER1BAF**	**28**	**14,850**	**80**	**75**										
PY4VB	**A**	**3,319,821**	**1705**	**657**	*JA3YPL	*	408,747	522	303	**RZ1AK**	**3.7**	**366,048**	**508**	**328**										
ER6A	**A**	**3,157,035**	**2055**	**749**				(Op: JJ3TBB)		**SQ4NR**	**3.7**	**64**	**4**	**4**										
		(Op: ER1LW)			*UA3LHL	*	406,690	553	335	***ZL1TM**	**A**	**2,184,138**	**1262**	**594**										
LY2IJ	**A**	**2,983,992**	**1795**	**762**	*SP9HQC	*	378,325	505	325	***RK9KWB**	**A**	**1,904,628**	**1209**	**564**										
JAØQWO	**A**	**2,758,612**	**1525**	**652**	***EI2CH**	**A**	**377,883**	**548**	**347**	***KG4GSY**	**A**	**524,755**	**616**	**385**										
EI4DW	**A**	**2,565,136**	**1585**	**619**	*OK8ACS	*	377,060	490	340	***KG6FFX**	**A**	**505,557**	**623**	**377**										
OK1EP	**A**	**2,498,720**	**1611**	**679**	*RN3FT	*	374,760	553	360	***OK2INW**	**A**	**478,201**	**582**	**367**										
EA8AJO	**A**	**2,049,114**	**1271**	**523**	*DF2SM	*	360,936	489	324	*OK2CMW	*	476,840	563	364										
JQ1BVI	*	1,726,332	1153	547	*AN1AUM	*	348,458	597	337	***KI8IZ**	**A**	**349,366**	**459**	**307**										
OE75CWL	**A**	**1,697,358**	**1181**	**611**	*LU5JKG	*	321,160	419	280	***W2RDS**	**A**	**273,408**	**426**	**267**										
		(Op: OE5CWL)			*SP7A	*	300,048	464	304	***ES6KW**	**A**	**211,862**	**346**	**259**										
JR1UJX	*	1,692,548	1146	538				(Op: SP7FQI)		***VE4MG**	**A**	**183,065**	**325**	**235**										
UA9ACJ	**A**	**1,460,412**	**986**	**452**	***MUØFAL**	**A**	**274,215**	**493**	**303**	***EA4EMC**	**A**	**115,210**	**242**	**205**										
AM6TC	*	1,370,014	1479	589	***PAØJNH**	**A**	**272,309**	**409**	**307**	***RW3AFY**	**A**	**108,942**	**246**	**201**										
VE7TLL	**A**	**1,330,355**	**994**	**485**	***RA2FBC**	**A**	**259,896**	**376**	**273**	***WP3GW**	**A**	**104,760**	**246**	**204**										
UT2IW	**A**	**1,201,431**	**1003**	**539**	***CX9AU**	**A**	**253,215**	**368**	**255**	***IR2D**	**A**	**73,892**	**215**	**182**										

BAND RESTRICTED

3W2KF	**A**	**2,215,218**	**1460**	**573**
		(Op: F5PBL)		
***JA5EO**	**A**	**775,008**	**715**	**414**
***S57MSU**	**A**	**708,995**	**721**	**431**
*S57NRO	*	581,600	656	400
***UA3LHL**	**A**	**406,690**	**553**	**335**
***ES6KW**	**A**	**211,862**	**346**	**259**
***OM2AWX**	**A**	**194,360**	**408**	**226**
*JA1BMS/1	*	185,148	326	222
***AN7BDL**	**A**	**182,210**	**404**	**274**
***RX9CEL**	**A**	**143,662**	**262**	**218**
***EC6PG**	**A**	**124,098**	**338**	**222**
***ON5JD**	**A**	**80,613**	**225**	**169**
*ON4CJN	*	43,008	176	128
*UA1ANX	*	36,570	143	115
*JK8WBR	*	23,352	100	84
*AO2BAH	*	15,471	86	81
		(Op: EC2BAH)		
*S57IIO	*	14,773	93	79
***LW7EGO**	**28**	**506,025**	**549**	**325**
***UA9JQN**	**28**	**274,256**	**394**	**281**
*UA9OUB	*	131,520	277	192
***VE2LHP**	**28**	**100,620**	**217**	**172**
***EF7AMD**	**28**	**7,865**	**73**	**65**
		(Op: EC7AMD)		
***M4T**	**14**	**30,915**	**161**	**135**
		(Op: GØVQR)		
***EC2ADR**	**21**	**154,375**	**457**	**247**
*EC4DFA	*	124,597	395	241
*EF3CJN	*	61,419	265	177
***JR3KAH**	**21**	**1,632**	**30**	**24**

ASSISTED

UNITED STATES

NB1B	**A**	**7,463,666**	**2584**	**1022**
NY6DX	**A**	**3,245,190**	**1645**	**785**
KV3R	**A**	**2,787,855**	**1550**	**735**
WN9O	**A**	**2,361,928**	**1325**	**758**
K9NR	*	2,096,823	1395	643
W2WB	*	1,549,976	947	626
N1RK	*	1,310,475	926	505
K4YT	**A**	**1,284,248**	**919**	**532**
N1NQD	*	1,075,986	736	529
W6TK	**A**	**1,063,868**	**847**	**499**
WW6O	*	968,060	874	485
N6CCL	*	670,306	678	406
K3KO	*	543,628	444	437
N6OU	*	529,016	622	356
KØHB	**A**	**409,860**	**498**	**324**
K3IXD	*	383,748	444	339
KE1KD	*	362,776	436	331
W2GO	*	361,248	460	318
WT4Q	*	324,852	402	321
WB8ZRL	*	287,649	362	279
N3ED	*	219,255	302	235
K3PP	*	137,034	254	207
NZ3O	*	122,946	228	186
K6JG	*	101,380	193	185
W3AP	*	64,175	170	151
W1SRD	*	61,560	163	135
W2LE	*	52,080	150	124
KD2P	*	43,870	126	107
N2WK	*	36,520	111	110
W7CT	**A**	**28,350**	**110**	**105**
WØTM	**28**	**408,148**	**496**	**334**
KO4MR	**28**	**392,763**	**458**	**317**
N5MT	**28**	**155,350**	**262**	**239**
N9LCR	**21**	**229,338**	**352**	**279**
***W2GG**	**A**	**979,215**	**812**	**485**
***NA1DX**	**A**	**933,092**	**728**	**487**
***W4GMM**	**A**	**593,072**	**641**	**367**
***W9RM**	**A**	**503,348**	**497**	**358**
*W2KA	*	234,864	349	233
***K6ACZ**	**A**	**196,092**	**319**	**234**
*AD1T	*	184,464	331	252
***N3KAK**	**A**	**50,874**	**143**	**139**
*N4JN	*	50,048	164	136

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

NF4A	**10,394,208**	**3910**	**1122**
WO8CC	**9,435,188**	**3516**	**1063**
NØNI	**7,678,888**	**2939**	**1064**
AI7B	**7,123,896**	**3024**	**936**
KG5U	**6,727,488**	**3256**	**947**
WZ6E	**6,429,384**	**2953**	**936**
W6XR	**6,153,728**	**2487**	**952**
NZ1U	**5,432,805**	**2291**	**945**
KY4AA	4,929,899	2245	941
AE9B	**4,693,986**	**2270**	**906**
NT6K	4,472,280	2493	820

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KD9ST	4,417,985	2223	835
W7VJ	4,072,503	2091	799
KØDU	3,752,325	2083	765
ABØS	3,076,528	1793	728
KS3F	**3,072,954**	**1618**	**799**
NA2X	2,840,740	1537	721
KTØR	2,797,768	1641	764
AB2DE	2,260,370	1426	659
WV2LI	1,610,728	1151	587
KØRAY	1,502,966	1240	542
N7WDX	1,451,439	1130	543
NØLM	1,213,504	1001	536
ABØMV	1,110,239	1025	533
N1XL	862,692	808	444
W3IQ	801,679	694	461
WX7P	723,360	827	440
WD5GSL	683,016	767	447
WØMA	627,594	595	407
NU4Y	620,307	636	439
W3IZ	548,064	542	352
KM8I	441,501	523	367
KF8UN	421,824	515	338
KJ9D	411,156	535	324
W1SMH	303,696	445	296
W3LJ	260,123	372	269
KF4ASU	227,657	392	251
WFØRT	101,638	234	178

DX

NORTH AMERICA

FM5GU	**19,260,780**	**5861**	**1137**
TO5T	17,203,704	5224	1176
VP5V	**16,578,672**	**5892**	**1122**
TO9T	**12,667,578**	**4805**	**1078**
VE5TP	**11,810,564**	**3934**	**1142**
VE3RM	**10,158,014**	**3430**	**1061**
VA3MG	8,719,029	3101	1023
VE3MIS	2,465,721	1427	657
VE2CMH	**948,703**	**769**	**433**

AFRICA

CQ9K	**26,146,204**	**6405**	**1292**
AM8CI	**14,199,840**	**3950**	**1080**
EA8KK	9,734,156	3193	974
ZD8K	**5,650,866**	**2564**	**738**
CQ3A	3,234,762	1584	666

ASIA

RF9C	**14,207,193**	**4063**	**1079**
UPØL	**13,894,586**	**4220**	**1007**
RWØA	**11,773,384**	**3655**	**1043**
RT9W	10,768,039	3498	929
JI2ZJS	**7,211,787**	**2796**	**913**
JH1EAQ	6,753,704	2632	908
JA1YPA	5,097,436	2106	857
P39P	**4,645,443**	**2342**	**627**
JI2ZEY	4,048,947	1854	777
4LØG	**4,690,560**	**2334**	**672**
TA2KD	**2,735,316**	**1523**	**513**
HLØO	**609,109**	**613**	**373**
RK9MXS	507,877	903	211

EUROPE

TM5C	**17,220,474**	**5172**	**1206**
IR4T	**16,123,620**	**4731**	**1236**
9A7A	**13,803,528**	**4464**	**1181**
SN2B	**13,298,688**	**4342**	**1152**
TM2Y	12,211,458	3908	1162
HG1S	**12,181,928**	**4065**	**1156**
ES5Q	**11,094,530**	**3826**	**1142**
TM2V	10,750,545	3815	1035
OT1C	**10,461,035**	**3585**	**1105**
OM7M	**10,085,637**	**3461**	**1121**
OH1F	**9,626,337**	**3454**	**1113**
LX5A	**8,612,016**	**3311**	**1064**
EA1EEY	**8,539,305**	**3361**	**997**
DL2ARD	**8,146,008**	**3297**	**967**
G4UJS	**7,084,340**	**3136**	**905**
OZ5ESB	**5,157,960**	**2440**	**811**
TM7Z	4,951,748	2530	844
LY8X	4,938,564	2448	886
9A8M	4,788,173	2294	839
4N7M	**4,714,875**	**2337**	**825**
IU2M	4,708,698	2199	894
OL5Q	**4,548,096**	**2183**	**846**
OT1P	4,319,154	2250	826
IQ9K	**4,040,543**	**2242**	**799**
AN1COZ	3,951,860	2103	781
DL6RAI	3,732,399	1989	781
RI4M	**3,458,760**	**2253**	**820**
TF3IRA	**3,446,471**	**2349**	**763**
I4GAS	3,432,209	1746	737
M2H	3,000,480	1782	705
YL7C	**2,951,416**	**1813**	**767**
IO4I	2,872,380	1677	735
RZ3DZF	2,765,445	1985	701
IO2L	2,633,624	1582	718
TMØS	2,618,896	1835	698
DL3KZA	2,589,494	1696	701
UX8IXX	**2,395,880**	**1898**	**712**
II9F	2,391,457	1675	709
ES2X	2,271,300	1528	670
DL3ABL	1,853,663	1281	629
LY2IN	1,702,772	1300	596
RW3WWW	1,665,631	1518	583
ON6BR	1,646,761	1237	593
US8U	1,644,138	1598	597
OZ7HAM	1,589,500	1334	578
OR5EU	1,545,528	1267	568
SP1PEA	1,529,280	1105	576
UR2E	1,514,142	1237	591
HB4FG	**1,443,338**	**1156**	**559**
AN2WP	1,442,298	1170	533
TM5K	1,345,120	1138	560
RK6XWA	1,322,937	1384	581
DLØIV	1,289,200	1049	550
JW8G	**1,240,304**	**1138**	**536**
S52SLO	**1,175,535**	**1126**	**519**
OM3KWZ	1,148,370	1048	505
F6KHK	1,136,280	963	510
RK6LZS	1,033,266	1069	507
IR3P	995,588	892	484
GX4NOK	955,017	949	489
OL1C	831,283	863	457
YU1AVQ	812,928	854	464
SI9ØØTKM	**767,448**	**879**	**459**
YU7KWX	760,840	796	460
M4U	735,672	911	453
F6KFI	699,744	766	444
SP9KRT	695,563	735	407
AN1RCM	664,698	722	417
YT1Z	660,858	740	418
CQ1CV	**565,920**	**739**	**432**
YU1INO	527,481	631	387
OZØP	481,806	579	377
SN6U	459,732	579	364
ES1XQ	447,174	606	351
AM4YK	439,582	546	377
AM7UR	380,564	685	356
SP9KDU	331,100	497	308
SK5MR	324,324	475	308
DLØGEO	292,616	426	316
RK4HWZ	275,686	543	307
SP9KDA	265,329	432	279
OL5KRT	260,643	451	283
IQ8D	245,917	444	301
OZØJ	236,812	417	292
M5W	194,756	376	269
UR4PWC	157,090	330	230
IV3NVN	121,011	255	193
OH2KU	106,128	254	198
DN1MA	56,100	181	150
HBØ/F6KQL	**51,888**	**180**	**138**
IR2G	48,224	161	137
OK1MJA	46,953	174	141
SK6D	35,378	156	133
OK5SWL	23,028	119	101
LY1ØXA	21,056	94	94
RZ3DZJ	11,700	100	90

SOUTH AMERICA

ZXØF	**31,700,536**	**7475**	**1318**
LV5V	**11,086,845**	**3696**	**1015**
LU1NF	10,574,700	3425	1047
LU5FB	9,319,768	3124	1016
OA4O	**8,730,150**	**3193**	**925**
ZY2AA	**7,206,528**	**2746**	**896**
LR7DX	5,851,725	2337	865
LU7FJ	4,125,693	1856	767
LU6DK	1,747,260	1100	571
PY2ZR	599,104	598	368
ZV3F	136,512	269	192
PY2GEC	102,120	234	148
ZW3F	100,050	221	174
PY2LDS	14,850	83	75

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

NZ8O	**21,485,294**	**6639**	**1333**
NR6O	**19,149,390**	**6657**	**1259**
W4MYA	**15,862,083**	**5288**	**1257**
WM2H	**13,211,358**	**4413**	**1126**
WR3L	**4,551,692**	**2126**	**844**
AK3Z	3,330,972	1822	804
KJ7BP	**166,124**	**343**	**238**

NORTH AMERICA

WL7E	**35,617,140**	**9009**	**1395**
KL7RA	34,081,690	8913	1415
VE5RI	**13,273,806**	**4643**	**1127**
VE6FI	**13,066,200**	**4387**	**1098**
VE7SCC	**4,988,585**	**2485**	**805**

ASIA

A61AJ	**51,659,150**	**11670**	**1450**
P3A	**42,728,368**	**9986**	**1297**
VR2KW	**2,651,125**	**1982**	**635**

EUROPE

OT1A	**31,830,425**	**8890**	**1415**
HG6N	**25,576,092**	**7676**	**1343**
RU1A	**25,152,028**	**7797**	**1324**
S5ØS	**25,047,270**	**7508**	**1335**
Z39A	**18,390,528**	**6746**	**1228**
ED4URE	**17,705,721**	**6037**	**1221**
LY7A	**15,629,124**	**5782**	**1204**
OL7R	**6,812,588**	**3159**	**964**
J41K	**5,781,672**	**3670**	**923**
OH6K	**5,163,868**	**2963**	**851**
PI4COM	**4,828,529**	**2456**	**899**
GM3GBZ	**4,536,960**	**2438**	**834**
ED7VG	**4,456,244**	**2591**	**884**
YZ7W	**2,356,260**	**1745**	**692**
OL5T	2,288,397	1420	687

OCEANIA

TX8G	**19,842,004**	**6165**	**1057**

SOUTH AMERICA

ZX5J	**46,185,516**	**10090**	**1476**
YW4M	**35,085,817**	**7995**	**1339**
L4ØF	**18,176,808**	**5132**	**1173**
PY3MHZ	11,166,096	3590	1059

CHECK LOGS

The following logs were used as check logs. Check logs and SWL logs are always appreciated.

4O1X, 4X6HP, 4Z5FL/M, 7S6W, A35RK, AN2JE, AN3ESZ, CE4B, CT1DYV, DF2OSB, DL1DT, DL1JFM, DL2OBN, DL2RTL, DL3MG, DL4JU, DL5DWW, DL5JMN, DL7UCX, DL7VMM, DL9NO, EA1APS, EA1CBX, EA2AGB, EA2CHL, EA3BJO, EA4BAH, EA4CBH, EA4TD, EA5FXS, EA7DWJ, EA8AVV, EA9BO, EC8AQQ, EC8AUZ, ER3CT, ES6MO, ES6RMR, F1ADG, IK5ZTT, IT9DAA, IZ1DPS, LA4YW, LA7FJA, LA7SI, LA9LO, LA9NM, LU3AHB, LU9APM, LZ2PS, LZ4UU, N2ALE, N2BJ, N8LIQ, OH1BV, OH6QU, OK1FHI, OK1VHV, OK8JRM, ONL7973, OZ7AX, PA2SWL, PA7DA, PA7DVD, PP5AM, PY1WMJ, PY6WJ, RA1QDP, RA2FW, RN3ZZ, RU3AA, RU3DG, RW1QM, RW3DY, RX3DTN, RX3VM, RZ3DX, SM1CXE, SM3R, SM6KND, SP1EGN, SP2ZCI, SP3BVI, SP3CUG, SP3MEP, SP4HHI, SP4IGV, SP5ES, SP7XK, SP9CVY, SP9GFI, SP9KAO/9, SP9KOV, SP9MDY, SQ4GXO, T98W, TF3MA, UAØBJO, UAØYAY, UA1PBI, UA3AGW, UA3BM, UA3LBE, UA3RF, UA3XJG, UA4LBK, UA4PFO, UA6AF, UN7DL, UR5AKU, UR7IRL, UT1EO, UT3NA, UT7QF, UUØJC, VE7FCO, W8QZA, WA2BMH, YCØQO, YC3IZK, YL2GTD, YO4ATW, YO4JQ, YO8AII, YO8COK, YO8CRU, YO8KCW, YO8SMI, Z36A, ZC4DW, ZS6HO.

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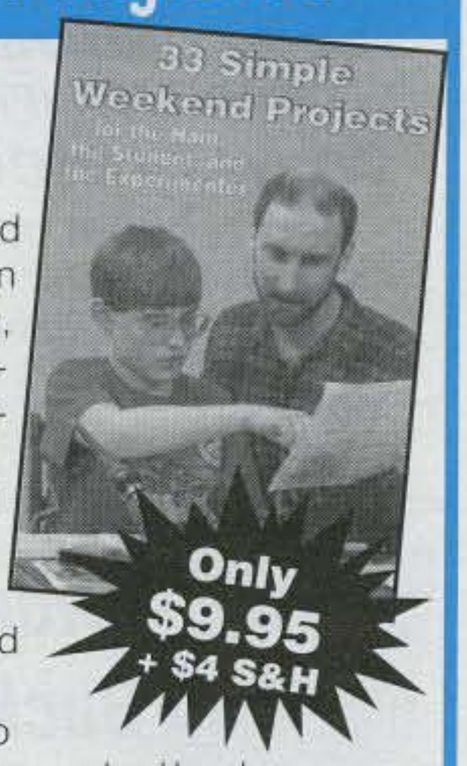

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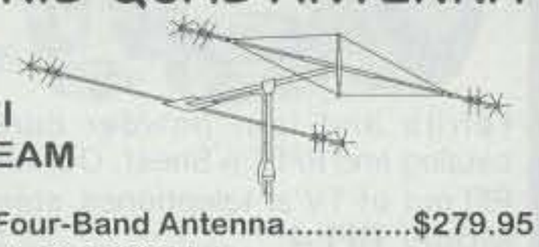

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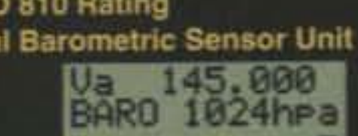

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